

Benefits without costs?
Side effects of implementation intentions

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1 INTRODUCTION:

SIDE EFFECTS OF IMPLEMENTATION INTENTIONS

Have you ever bid too much on eBay? The initial idea for the present research came from the area of online auctions, where used books sometimes are auctioned for a higher price than identical new ones. This dysfunctional bidding behavior might result from plans to get a certain product being automatically implemented, along with the consequent failure to disengage from the ineffective behavior. If this automaticity also applies to somewhat similar situations, potential negative side effects of plans should be the consequence (e.g., changed consuming behavior in a store). The aim of the current research is to examine these potential side effects of plans.

The *automaticity* resulting from plans has been addressed in research on implementation intentions (Gollwitzer, 1993; see section 3 for a detailed definition of implementation intentions). Implementation intentions are specific plans in the form “If situation X arises, I will initiate behavior Y” that have been suggested to improve goal attainment. It has been argued that by one intentional act of will, implementation intentions might lead to an *improved detection of the specified situation* and the *automatic initiation of concrete goal-directed behaviors* as soon as the specified situation arises. Thus, they are a metacognitive self-regulatory tool at the interface of automatic and controlled processes that helps to overcome problems in relation to the successful implementation of goals (e.g., getting started, not missing good opportunities to act). To date, their effectiveness has been supported in an impressive range of samples and measures from highly controlled experiments on perceptual and behavioral consequences and processes to real world issues in the domains of health, work, environment, and intergroup relations (for an overview, see

Gollwitzer & Sheeran, 2006; Gollwitzer, Bayer, & McCulloch, 2005). Beside their effectiveness, potential costs of implementation intentions have been discussed. First, their automaticity was doubted, but was then convincingly demonstrated in various studies (e.g., Aarts, Dijksterhuis & Midden, 1999; Brandstätter, Lengfelder & Gollwitzer, 2001). Second, negative consequences of this automaticity of implementation intentions were expected in terms of potential *inaccuracy* of the perception of internal or external conditions and of potential *rigidity* that should follow from their automaticity. Whereas it has been shown that implementation intentions do not have costs in terms of inaccuracy (Webb & Sheeran, 2004) the potential rigidity has not been systematically examined. It was discussed that rigidity as a result of implementation intentions might occur in form of people sticking to the situations and behavior specified in an implementation intention and thus fail to take advantage of unanticipated good opportunities for actions (Brandstätter et al., 2001; Gollwitzer, 1999; Gollwitzer & Brandstätter, 1997). But such a reduced openness to suitable alternatives was argued to not be critical because people can always give up their commitment to the respective superordinate goal intention or implementation intention. In addition, people are also supposed to be able to use the cognitive capacities that become available through the automaticity of implementation intentions to recognize alternatives (Gollwitzer, 1999). Thus, rigidity as a result of implementation intentions is to be expected only when the specified situation is actually encountered. This type of rigidity is assumed to be functional, because it protects an ongoing goal pursuit from intrusions (Gollwitzer, 1999).

However, to date no research has examined the possibility that this rigidity of implementation intentions when the specified situation is actually encountered could interfere with the pursuit of other goals that are actively held. Thus, the question is, whether the presence of the specified situation during the pursuit of other goals (i.e., actions) leads to unintended side effects of

implementation intentions. Hence, the aim of the present research is to examine these potential side effects. More specifically, two main research questions will be investigated:

- *Do situational cues of implementation intentions attract attention even during the pursuit of another goal and thereby bias attention in an automatic fashion?*
- *Do behaviors specified in implementation intentions generalize to situations where the situational cue of an implementation intention is present but another goal is pursued and thereby bias behavior in an automatic fashion?*

The first research question aims to inspect attentional side effects of implementation intentions that are caused by the situational part of the implementation intention. The second research question extends these attentional side effects to behavioral side effects of implementation intentions that are caused by the situational part of the implementation intention in combination with the behavioral part.

2 GOALS AND INTENTIONS

Intentions have been used within different research traditions. Thus, the selected theories that will be presented in this section do not follow a stringent timely sequence. Instead, the selected theories will be introduced according to their main focus concerning different stages of goal pursuit. This procedure allows differentiating the different definitions of intentions and their role during goal pursuit. In *motivational theories*, intentions are important as behavioral proxies that amongst other influences (see 2.1) result from processes of goal setting (i.e., when an intention is defined), whereas in *volitional theories*, intentions are important as starting point of goal striving processes (i.e., how an intention is turned in action). Thus, intentions are central for theorizing on goal setting processes (e.g., theory of planned behavior, Ajzen, 1991) as well as goal striving processes (e.g., linkage theory of intentions, Ach, 1935). In the following, *motivational theories on intentions* in relation to goal setting as well as two early *volitional theories of intentions* in relation to goal striving are discussed (intentions as links, Ach, 1935; intentions as quasi-needs, Lewin, 1951). Next, a more recent integrative intention theory is presented (intentions as transitions between action phases, Heckhausen, 1991; Gollwitzer, 1990) that serves as main theoretical framework for the present research. Finally, the role of intentions in contemporary research on self-regulation (e.g., self-regulation theories, Carver & Scheier, 1998; Kruglanski et al., 2002) and the converging methods from research on cognition as well as motivation are discussed that provide the theoretical background for most of the methods that are used in the present thesis.

2.1 Intentions in motivational theories

During the last decades, intentions have mostly been operationalized as behavioral proxies in motivational theories on the relation between attitudes and behavior. Representative of these expectancy-value models is the *theory of reasoned action* (Fishbein & Ajzen, 1975) and its extension to the *theory of planned behavior* (Ajzen, 1991). Within these theories, attitudes are assumed to be evaluations of actions, whereas intentions should indicate a person's willingness to act and thus have been proposed as the proximal cause to behavior. A formed intention depends on the attitude towards a critical behavior (i.e., the expected value), the experienced normative pressure to execute it (i.e., subjective norm) and the self-efficacy (i.e., perceived control over the behavior; Bandura, 1986).

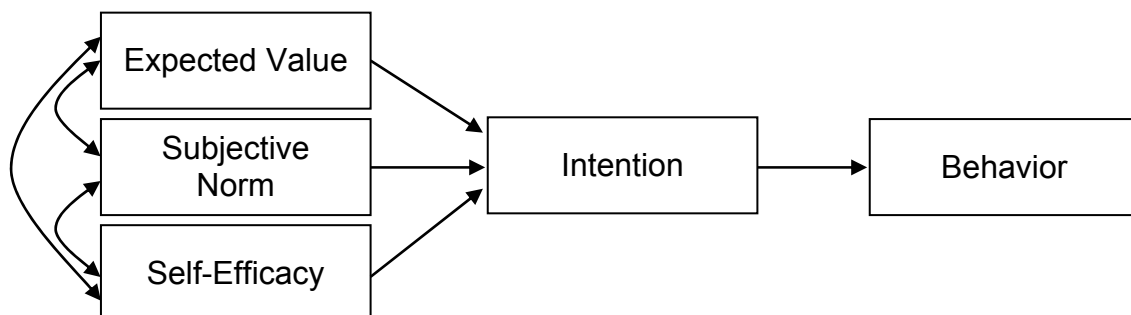


Figure 1: Theory of planned behavior, Ajzen (1991).

The higher the expected value and the perceived control (i.e., self-efficacy), and the more favorable the norm is perceived (i.e., subjective norm), the higher should be the likelihood that an intention is formed and a certain behavior is shown. Thus, the intention construct following the theory of planned behavior summarizes a person's motivational orientation towards an act or behavioral goal. Ajzen (1991, p.181) stated that "Intentions are assumed to capture the motivational factors that influence a behavior, they are indicators of how hard people are willing to try, of how much effort they are planning to exert,

in order to perform the behavior”. Underlining their usefulness, in a recent meta-analysis (Sheeran, 2002), intentions have been demonstrated to explain 28 % of the behavioral variance. The theory of planned behavior (Ajzen, 1991) recognizes that the intentions people form differ in terms of the abstractness of the desired goal. Intentions that specify concrete goals predict behavior better than intentions that specify abstract goals. But the theory of planned behavior (Ajzen, 1991) does not include the possibility that people specify when, where and how to act to implement their goals (i.e., form implementation intentions; see section 3 for a detailed definition of implementation intentions). Thus, the one-directionality of the intention formation as it is used in the theory of planned behavior (i.e., only when the result of the three preconditions are positive) was criticized because it does not speak to the possibility that people form intentions, when they anticipate difficulties during the execution of intended behaviors and that intentions themselves can promote the implementation of an intention (Gollwitzer, 1993).

2.2 Intentions in volitional theories

A linkage theory of intentions

Intentions have been the subject of psychological theorizing before they were included in theories on the attitude-behavior relation. The Würzburg school of thought first examined the concept of *intentions* in terms of psychological theorizing. Within “will psychology” (Ach, 1905, 1910, for a summary, see Ach 1935) Narziß Ach introduced a *linkage theory of intention* with the concept of determination that aimed to predict how an intention is transferred into a reliable execution of the intended action. Thus, whereas theories on the attitude-behavior relation operationalized intentions only as an outcome of certain preconditions (i.e., as dependent variable or endpoint of the motivational phase), the linkage theory of intentions defined intentions as a

starting point of volitional processes (i.e., as independent variable). This approach allowed a closer inspection of the processes related to goal striving. Even then, Ach (1910, 1935) speculated that determination might work outside of people's awareness. That is, when the specified situation is encountered, the associated behaviors are initiated without conscious intent to get started. With regard to underlying processes he speculated that the specified situation biases the perceptual and attentional processes in the direction of the intention. In addition, he suggested the concreteness of the situations as well as of the behaviors as moderators. Whereas Ach's theorizing was functional to analyze concrete intentions (e.g., to send off a letter) it is less clear on higher order goal intentions (e.g., to have children) because he did not reflect on the interrelation between goal intentions and implementation intentions.

A quasi-needs theory of intentions

Later, Lewin (1926, 1951) suggested an *intentions as needs* approach. He assumed that intentions assign valence to objects and events (i.e., situations) in people's environment (in German "Aufforderungscharakter"), in a similar way to needs and that these quasi-needs lead to action initiation. This intensity of the tension associated with the quasi-need, their relation to superordinate drives and general life goals, should moderate the amount of effort to execute the intention-related behaviors. Thus, Lewin addressed the interrelation of goal intentions (i.e., decisions whether or not to pursue a goal in the form "I intend to achieve goal X", see section 2.3 for a detailed definition of goal intentions) and the intentions as described by Ach. He assumed that the Ach-type intentions depend on the strength of the higher order goal intention. Only when goal intentions are strong, should they effectively promote goal pursuit. In his research, he did not examine specific behaviors that are associated with the quasi-needs, but he assumed that any behavior that

reduces the tension should be appropriate. Thus, whereas Ach's theorizing included assumptions about mediation processes (the link between situation and behavior), Lewin described moderators of the intention-action relation (i.e., the strength of the underlying goal, the activation of the objects or events).

2.3 The integrative Rubicon model of action phases

To allow a closer inspection of intentions and to integrate processes of goal setting as well as of goal striving modern theorizing build upon Ach's and Lewin's ideas. The questions of when intentions are most effective, how they achieve their effectiveness and when they are formed are addressed in the *Rubicon model of action phases* (Gollwitzer, 1990; Heckhausen, 1987; 1991; Heckhausen & Gollwitzer, 1987). The model assumes that individual's cannot pursue all their wishes and desires and thus are forced to make a choice, which is preceded by deliberating the feasibility and desirability of the respective wishes. The higher the perceived feasibility and desirability of the respective wishes, the higher is the likelihood that the wishes are turned into binding goals, a person feels committed to. The enactment of relevant goal-directed behaviors depends not only on the feasibility and the desirability of the goal but also on the perceived suitability of the situational context and the feasibility and desirability of other goals. Whereas the Rubicon model of action phases is similar to traditional motivational theorizing in relation to goal choice (i.e., goal setting, see for example, theory of planned behavior, Ajzen, 1991) it also takes into account problems (i.e., variables) in relation to the implementation of a chosen goal (i.e., problems in relation to goal striving processes). Thus, differences between the motivational issue of goal choice (goal setting) and the volitional (willful) pursuit of goal implementation can be examined in more detail than in traditional theories.

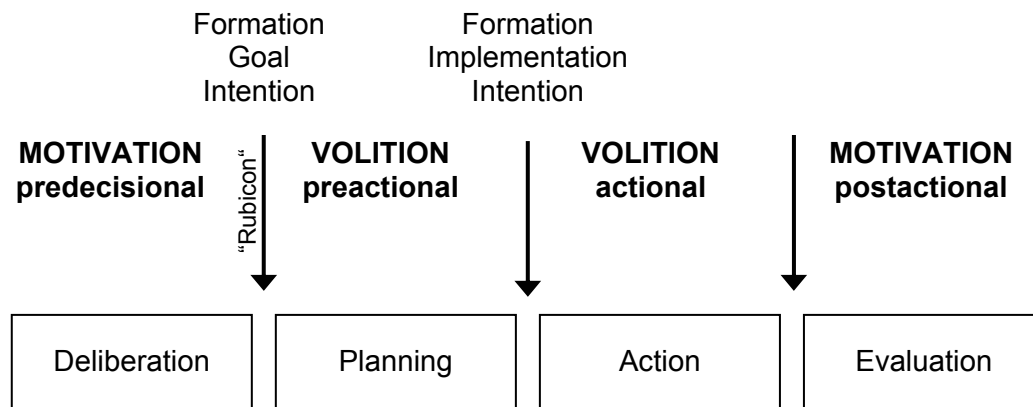


Figure 2: The Rubicon model of action phases, Heckhausen (1991).

Central to the model is the comprehensive temporal view of goal pursuit from a person's wishes and desires to the evaluation of attained outcomes. The model specifies four different, consecutive action phases. In a *predecisional phase*, people deliberate on the desirability and the feasibility of wishes and desires. After the actual decision, effective planning takes place in the subsequent *postdecisional* (also preactional) *phase*. The following *actional phase* deals with the initiation of the relevant actions and with focusing on the effective attainment of the desired outcomes. After the attainment of these outcomes a *postactional evaluative* phase should follow where an individual tries to find out whether further attempts are worthwhile or necessary in order to realize the respective wish.

Within the Rubicon model of action phases, intentions are especially important to describe the transition between different action phases. On the transition from the predecisional phase to the preactional (i.e., postdecisional) phase, the movement towards a behavioral goal is assumed to culminate in the establishment of a *goal intention* (e.g., "I intend to exercise regularly"; i.e., decisions whether or not to pursue a goal). These goal intentions parallel Ajzen's (1991) view of intention formation, where a decision regarding the

performance of a behavior (the behavioral intention) is predicted by the person's attitude, subjective norm, and perceived behavioral control. On the transition from the preactional phase to the subsequent actional phase, a second type of intention becomes important. To promote goal attainment via effective planning *implementation intentions* (e.g., "If I come home from work, I will go running for 40 minutes"; for a detailed definition, see section 3) can be formed by individuals. They might help overcoming problems associated with the initiation of the respective planned behavior that might occur during the implementation of the planned behavior (e.g., missing good opportunities to act, getting started). Taken together, within the Rubicon model of action phases, goal intentions are proposed to be especially important in the predecisional phase as they mark the transition point (i.e., the so called "Rubicon") to the next phase. Implementation intentions are especially important in the preactional phase to overcome potential obstacles that might be met during goal pursuit.

The Rubicon model of action phases also stimulated the theoretical concept of mind-sets. Mind-sets refer to general cognitive orientations with distinct features (Heckhausen & Gollwitzer, 1987; Gollwitzer, Heckhausen, & Steller, 1990). That is, involvement in a task that is relevant to a specific action phase should activate relevant cognitive procedures that should facilitate the respective task and are thus beneficial to task completion. In the predecisional phase, a deliberative mind-set (induced by deliberating about desires and wishes) has been demonstrated (Heckhausen & Gollwitzer, 1987) that leads to more open-mindedness in processing available information as a result of the cognitive orientation. In the preactional phase an implementational mind-set has been demonstrated that leads to certain closed-mindedness with regard to irrelevant information (Heckhausen & Gollwitzer, 1987). Thus, it should help to overcome problems related to the goal implementation (e.g., being distracted by other goals, pessimistic about the feasibility of the specified goal, doubting the desirability of the respective goal). An impressive body of research supports

these assumptions (e.g., Bayer & Gollwitzer, 2005; Brandstätter & Frank, 2002; Gollwitzer & Kinney, 1989; Taylor & Gollwitzer, 1995). It is especially noteworthy that the concept of mind-sets was one of the first that bridged the gap between motivational and cognitive research and demonstrated a systematic relation between motivation (i.e., motivational orientations: predecisional phase, preactional phase) and cognition (i.e., cognitive processing modes: deliberative vs. implementational mind-set).

Taken together, the Rubicon model of action phases inspired research on goal intentions, implementation intentions and mind-sets. As the current work focuses on implementation intentions and also relates to goal intentions, the Rubicon model of action phases has been chosen as most suitable theoretical framework. Within the pursuit of a goal (i.e., action phase) it pictures the relation between goal intentions and implementation intentions and allows to make predictions, when intentions are formed and when they are most effective. But to address the processes by which potential costs of the automaticity of implementation intentions come about, the structural and representational perspective of recent research on motivational processes has to be taken into account in addition to the Rubicon model of action phases. This perspective is important for the examination of the research questions of the present thesis as most of the methods refer to it. Thus, before the concept of implementation intentions will be examined more closely in section 3, a short summary of this perspective follows.

Recent theories on self-regulation (e.g., Carver & Scheier, 1998; Kruglanski et al., 2002) have led to impressive advances in research on goal striving because they model *processes* underlying goal pursuit instead of focusing on the effects of different goal *contents* on goal striving (e.g., Locke & Latham, 1990; Bandura & Schunk, 1981). Specifically, they address volitional (willful) processes in relation to goal striving but not motivational processes

(e.g., the choice of specific goals) in relation to goal setting. Thus, self-regulation theories are similar to theorizing on implementation intentions concerned with implementational problems related to the when, where, and how of goal pursuit.

Self-regulation theories as well as goal theories refer to internal subjective goals (Oettingen & Gollwitzer, 2001) and hence goal-directed behavior is defined as behavior in relation to subjective goals that a person feels committed to (e.g., the goal to be fair in negotiations would be the reference point for the analysis of effort or behavior that has to be shown to achieve this goal). Deviating from previous theories, self-regulation theories work with a new operational definition of goals. Goals are defined as *mental representations of desired end-states that initiate and guide behavior* (e.g., Kruglanski et al., 2002). This definition follows a motivation-as-cognition instead of a motivation-vs.-cognition paradigm that allows transferring the knowledge of representations and cognition to the study of goals. For example, when treating goals as representations, their connections to contexts, actions, and other goals can be treated similar to those of other types of representations. Thus, this definition of a goal can lead to a better understanding of how goals are activated, how they activate the actions used to satisfy them, and how to strengthen or inhibit the activation of other representations (e.g., other goals, means). Similarly to goals, the methods of the motivation-as-cognition paradigm have also been successfully applied to the concepts of goal intentions and implementation intentions (e.g., Malzacher, 1992; Aarts et al., 1999; Gollwitzer, Trötschel, & Sumner, 2002, cited in Gollwitzer et al., 2005). For example, Aarts et al. (1999) used a measure of the accessibility of the mental representation of specific cues in their research on implementation intentions. In a lexical decision task, words decisions were faster for words contained in an implementation intention compared to neutral words. This heightened accessibility of implementation intention cues was demonstrated to mediate the

effects of the formation of an implementation intention on goal attainment (i.e., picking up a food coupon). Thus, research on goal intentions and implementation intentions benefits from the process-orientation of research on self-regulation and the converging methods in the research fields of cognition and motivation. Mental operations known from research on cognitive processes can most likely also be applied to the analyses of motivational processes.

2.4 Summary goals and intentions

Taken together, *intentions* can not only be seen as the product of the motivational phase of goal setting (e.g., theory of planned behavior, Ajzen, 1991), but also as a starting point for the volitional phase in the pursuit of behavioral goals that includes all processes related to goal striving (e.g., intentions as links, Ach, 1935; or quasi-needs, Lewin, 1951). As an integrative theory of intentions that comprises processes of goal setting as well as of goal striving, the Rubicon model of action phases (Heckhausen, 1991) qualifies as the most suitable model for the investigation of side effects of implementation intentions. Beside this approach, intentions are an important construct in the context of self-regulation theories of goal striving, and also benefited from advances of this research with regard to the process orientation and the methods (i.e., goals and intentions as mental representations; convergence of motivational and cognitive research methods) of this structural and representational perspective that will be used to examine the research questions of the present thesis.

3 IMPLEMENTATION INTENTIONS

The next section aims to elaborate on the concept of implementation intentions (Gollwitzer, 1993, 1999), to give an overview of available evidence of their benefits and costs, to consider the processes underlying their effects, to examine potential side effects of implementation intentions, and to present an overview of the present research.

3.1 The concept of implementation intentions

Implementation intentions are a concept that, like the goal intention and the mind-set concept, were stimulated by the Rubicon model of action phases (Gollwitzer, 1990; Heckhausen, 1987; 1991; Heckhausen & Gollwitzer, 1987; see section 2.4). They are defined as a special form of planning that necessitates the commitment of an individual to a specific goal-directed behavior in response to specific situations (Gollwitzer, 1999). The formation of an implementation intention just needs the specification of a situation and a behavior *when*, *where* and *how* a person plans to pursue a certain goal in the form “*If situation X arises, I will perform behavior Y*”. Thus, they link an anticipated future situation (situation X) with a specific goal-directed behavior (behavior Y). As a consequence, the initiation of the specified actions is assumed to carry features of automaticity (Gollwitzer, 1999, Gollwitzer & Schaal, 1998). That is, it should be swift, efficient, and not require conscious intent (e.g., Bargh, 1994; Logan, 1988, 1992; Moors & De Houwer, 2006; Shiffrin & Dumais, 1981; Shiffrin & Schneider, 1977).

Functionally, implementation intentions are subordinate to goal intentions (Sheeran, Webb, & Gollwitzer, 2005). Goal intentions specify a desired end-state, which may be the execution of a concrete behavior or the

attainment of a desired outcome in the form “I intend to achieve goal Z.” They commit a person to achieving the specified desired end-state, but not to the execution of a specific behavior in response to a specific situation. Whereas goal intentions mark the transition from the predecisional to the preactional phase in the Rubicon model of action phases (similar to the intentions specified in the theory of planned behavior, Ajzen, 1991), implementation intentions mark the transition from the preactional to the actional phase. That is, they delegate the initiation of the specified behavior (Y) to the specified situation (X) and thus to environmental cues.

Implementation intentions have been suggested to be particularly effective, when problems related to the initiation of a goal pursuit are anticipated. That is, if for example goal intentions can be enacted in a variety of different ways, or the time and location of their pursuit are uncertain. Under such conditions, they should be unlikely to be enacted, because good opportunities for action are likely to be missed (e.g., Orbell & Sheeran, 2000). To overcome such problems in relation to the regulation of goal striving processes (i.e., self-regulatory problems), implementation intentions can be formed.

3.2 Benefits of implementation intentions

The concept of implementation intentions has been applied across a range of samples and measures of behavior. In a meta-analysis of 15 studies on the impact of implementation intentions on goal attainment (Sheeran, 2002) they were shown to have a medium sized effect, $d = .70$. Beneficial effects of implementation intentions on goal attainment were found for behaviors that people intend to enact as well as for behaviors people intend to inhibit.

An area where implementation intentions have repeatedly been applied is health-promotion and disease-prevention. Participants who formed implementation intentions were more likely to attend cervical cancer screenings (Sheeran & Orbell, 2000), take vitamin supplements (Sheeran & Orbell, 1999), perform breast self-examination (Orbell, Hodgkins, & Sheeran, 1997), eat healthily (Verplanken & Faes, 1999), exercise (Milne, Orbell, & Sheeran, 2002), and resist alcohol consumption (Murgraff, White, & Philipps, 1996).

Furthermore, implementation intentions were found to help people to be fair in negotiations (Trötschel & Gollwitzer, in press), to behave environmentally friendly (Bamberg, 2000), to memorize intentions (Chasteen, Park, & Schwarz, 2001), to stay focused, even among opiate addicts, schizophrenic patients as well as under cognitive load (Brandstätter et al., 2001). They also improved attitudes towards new products and their use (Kardes, Cronley, & Posavac, 2005), helped to overcome unrealistic planning (i.e., planning fallacy; Koole & Van't Spijker, 2000), to overcome mundane behaviors (Aarts et al., 1999), and to write job applications more continuously (for an overview, see Gollwitzer et al., 2005; Gollwitzer & Sheeran, 2006).

To promote goal attainment in relation to unwanted behaviors, three different forms of implementation intentions have been suggested. They can be directed at the facilitation of tasks ("If situation X arises, then I will perform behavior Y"), but can also aim to suppress unwanted responses ("If situation X arises, then I will not perform behavior Y"), or to ignore the specified situation ("If situation X arises, then I will ignore it!"), (see Gollwitzer et al., 2005). Although most positive effects of implementation intentions were demonstrated using task facilitative implementation intentions, there is initial evidence that especially behavior suppression implementation intentions are effective in suppressing habitual stereotypical and prejudicial responses (Achtziger, 2002; Gollwitzer, Achtziger, Schaal, & Hammelbeck, 2002, both cited in Gollwitzer et

al., 2005), and in blocking detrimental self-states (Gollwitzer & Bayer, 2000, cited in Gollwitzer et al., 2005; Webb & Sheeran, 2003, Study 2). In line with most of the implementation intention research (Gollwitzer et al., 2005; Gollwitzer & Sheeran, 2006), the present research used task facilitative implementation intentions as they most plausibly represent the implementation intentions people naturally form. Thereby, they contribute to the external validity of the present research.

In sum, these studies provide overwhelming evidence that implementation intentions improve the attainment of goal intentions that are easy to forget (e.g., regular intake of vitamin pills, Sheeran & Orbell, 1999), not easily attained (e.g., writing a report about Christmas Eve during the holidays, Gollwitzer & Brandstätter, 1997), or somehow unpleasant (e.g., engaging in physical activity, Milne et al., 2002). Furthermore, implementation intentions improve not only the attainment of goals that need so called “one-shot” (i.e., singular) behaviors (e.g., pick up a food coupon, Aarts et al., 1999) but also of goals that demand repeated behaviors (e.g., regular breast self examinations, Orbell et al., 1997).

3.2.1 Moderators of implementation intention effects

Five potential moderators of these effects have been revealed by previous research. First, the *difficulty of the initiation of the goal-directed behavior* was found to moderate the implementation intention effects on goal attainment. Implementation intentions were effective in promoting the completion of goals that were difficult to implement but not of goals that were easy to implement (Gollwitzer & Brandstätter, 1997, Study 1).

Second, the *strength of the commitment to the respective goal intention* moderated the implementation intention effects on goal attainment (Orbell et al., 1997). Implementation intentions only improved the frequency of breast self-examinations in women who strongly intended to perform the breast self-

examination but not in women who held weak goal intentions to perform the breast self-examination. Similarly, implementation intentions only improved the number of hours of independent study, when participants held a strong goal intention but not when they held a weak goal intention to study (Sheeran et al., 2005).

Third, the *activation of the superordinate goal intention* was found to moderate the effects on goal attainment. Sheeran et al. (2005, Study 2) provided evidence that implementation intentions are sensitive to the activation of the respective superordinate goal intention. Implementation intentions to speed up responses only had their desired effect in a lexical decision task when the speed goal but not when an accuracy goal was activated. The results are especially noteworthy as the respective superordinate goal has been activated outside of participants' awareness. This moderation of the implementation intention effects is also referred to as goal-dependent automaticity (see also section 3.2.3).

Fourth, the *strength of the commitment to the respective implementation intention* also influences their effects on goal attainment (Gollwitzer, Bayer, Steller, & Bargh, 2002, cited in Gollwitzer et al., 2005). Implementation intentions promoted goal attainment, when participants were told that they benefit from rigidly adhering to their plan but not when they were told that they would benefit from staying flexible (Seehausen, Bayer, & Gollwitzer, 1994, cited in Gollwitzer & Schaal, 1998).

Finally, the *strength of the mental link between the if-part (situation X) and the then-part (behavior Y) of an implementation intention* has been suggested as a moderator of implementation intention effects (Gollwitzer et al., 2005). The more time and concentration a person takes to encode the specific

if-then plan, the stronger the link between the situation-behavior should be, and the stronger the implementation intention effect(s).

In sum, implementation intentions promote goal pursuit more efficiently when they are directed at goals that are difficult to implement, a strong commitment towards the goal intentions as well as the implementation intentions is given, the respective superordinate goal intention is activated when the situation specified in the implementation intention is encountered, and a repeated and concentrated encoding of the implementation intention was conducted.

3.2.2 Processes underlying implementation intention effects

Why are implementation intentions effective? Gollwitzer and Schaal (1998) suggested that implementation intentions affect goal pursuit through the use of three mechanisms. First, implementation intentions lead to a heightened accessibility of the mental representation of the situational cue (X), which in turn facilitates the detection of the situational cue in the environment. There is strong evidence for this *perceptual readiness effect* (Aarts et al., 1999; Seehausen et al., 1994 and Steller, 1992 both cited in Gollwitzer & Schaal, 1998; Webb & Sheeran, 2004). For example, in an experiment of Aarts et al. (1999) participants had the goal to pick-up their participant compensation close to a fire-hose in the hallway. Those who formed an implementation intention showed higher accessibility of the word fire-hose in a lexical decision task (compared to participants holding the same goal but no implementation intention).

Second, Gollwitzer and Schaal (1998) suggested that implementation intentions bias *attentional processes* (i.e., the situational cue (X) is assumed to attract attention, even during the pursuit of other goals). This implies that after forming an implementation intention, attention is attracted by good opportunities

to act, even when the person is focusing on an alternative goal. Thus, the attraction of attention can be seen as a precondition that good opportunities to act are not missed and the implementation intentions can unfold their effects. Unfortunately, almost no research has so far addressed the impact of implementation intentions on attention (for an exception and its limitations see the work summarized in section 4 by Steller, 1992 cited in Gollwitzer, 1993).

Finally, the formation of an implementation intention links the situational cue (X) to the specified behavior (Y). This delegates the initiation of the behavior (Y) to the situational cue (X), (Gollwitzer & Schaal, 1998). In other words, implementation intentions establish a situation-behavior link and in turn the situational cue (X) has a similar effect as primes in automatic behavior (Bargh & Ferguson, 2000). Evidence for this *behavioral readiness* (i.e., automatic action initiation) was provided by various studies (Brandstätter et al., 2001; Malzacher, 1992; Webb & Sheeran, 2004).

Taken together, implementation intention effects on goal pursuit are mediated by perceptual (i.e., improved detection of situational cues of an implementation intention) as well as behavioral processes (i.e., the automatic initiation of a specified action in response to a specified situation as a consequence of a situation-behavior link). In addition, attentional processes have been suggested to be biased by implementation intentions (i.e., attraction of attention, even during the pursuit of other goals).

3.3 Costs of implementation intentions

3.3.1 Limitations of their effectiveness

Besides evidence for the various benefits of implementation intentions also limitations of the effectiveness of implementation intentions have been observed by previous research.

Limitations of the effectiveness of implementation intentions have been found in their ability to overrule unwanted habits. Implementation intentions have important parallels to habits and are even described as instant habits (Gollwitzer et al., 2005). Both operate relatively automatically and rely on cue-response relations (Sheeran et al., 2005). In addition to several studies that found that implementation intentions are effective in overcoming unwanted habits (Aarts et al., 1999; Gollwitzer et al., 2002, cited in Gollwitzer et al., 2005), there is also evidence that implementation intentions do not overrule habitual behavior. For example, in a Study on eating habits, implementation intentions led those with unhealthy eating habits to eat healthier, but only in habit-unrelated respects and thus did not break the negative influence of unhealthy eating habits (Verplanken & Faes, 1999). Also, implementation intentions did not reduce the amount of relapse errors in routinized decision making (Betsch, Haberstroh, Molter, & Glöckner, 2004). Although no consistent moderation of the implementation intention effects by habit strength has been found, habits seem to represent a limit of the effectiveness of implementation intentions.

3.3.2 Reported unexpected costs

Beside these limitations, implementation intentions have also been found to lead to costs in form of overmotivation effects. Here, a set of conditions has been identified where implementation intentions bias behavior in the opposite direction to that intended. In two studies on the effects of task-facilitating implementation intentions to work harder in the presence of distractions (Schaal & Gollwitzer, 1997, cited in Gollwitzer & Schaal, 1998) implementation intentions actually hampered performance. More specifically, task-facilitation goal intentions and implementation intentions that are formed on top of being highly motivated led to weaker performance in arithmetic tasks (selected from the concentration achievement test, Düker, 1953) compared to only task-facilitation goal intentions without implementation intentions that were formed in addition to being highly motivated. As an explanation of these findings

overmotivation (Baumeister, 1984; Heckhausen & Strang, 1988) is discussed. That is, only when the task at hand is not too involving to begin with (e.g., unattractive, boring) should task-facilitative implementation intentions be beneficial to automatically increase effort. If the task at hand is involving, task-facilitative implementation intentions become dysfunctional and should lead to an overmotivation that hampers task performance. This implementation intention induced bias in behavior should not be too harmful when people notice the dysfunctionality of their implementation intentions and disengage from them. But in fact, in the reported Study (Schaal & Gollwitzer, 1997, cited in Gollwitzer & Schaal, 1998) they did not. This was interpreted as showing that “implementation intentions produce a form of automaticity that is not easily escaped” (Gollwitzer & Schaal, 1998, p. 130). Thus, it should be rather unlikely that persons notice perceptual biases as well as behavioral biases of implementation intentions and adapt to optimize goal attainment dependent on the functionality or dysfunctionality of an implementation intention for successful goal attainment (see section 6.1 for a detailed discussion).

3.3.3 Investigated costs of implementation intentions

Besides the beneficial effects of implementation intentions and the reported unexpected costs, other potential costs for the pursuit of the respective superordinate goals were frequently discussed and have been addressed in several studies (Brandstätter et al., 2001; Gollwitzer, 1999; Gollwitzer et al., 2005; Gollwitzer & Brandstätter, 1997; Sheeran et al., 2005).

Overall, two sources of cost have been classified: First, the automaticity of implementation intentions was questioned and potential costs in terms of cognitive processing have been discussed. Second, consequences of their automaticity in terms of potential inaccuracy to internal or external conditions, or paradox effects, have been examined.

With respect to the “automaticity” of implementation intentions, it has been suggested that holding them actually leads to *costs in terms of producing high degrees of ego-depletion*. This argumentation follows from ego-depletion theory (Muraven, Tice, & Baumeister, 1998) that assumes that any self-regulatory strategy has costs with respect to a person’s general resource for self-regulation. Contrary, it was argued that implementation intention do not lead to ego-depletion because they delegate the control of the behavior to environmental cues and thus the self should not be implicated (Gollwitzer & Bayer, 2000, cited in Gollwitzer et al., 2005; Webb & Sheeran, 2003). Evidence for the hypothesis that implementation intentions do not lead to ego-depletion was provided by Webb and Sheeran (2003). They found that participants who formed an implementation intention for an exhaustive task (i.e., Stroop task) persisted longer in a subsequent unsolvable puzzles task compared to participants who did not form an implementation intention for the unrelated Stroop task. Similarly, Gollwitzer and Bayer (2000, cited in Gollwitzer et al., 2005) demonstrated that furnishing the goal to control emotions with an implementation intention led to better performance in a difficult anagram task that followed a humorous movie compared to a condition in which participants only formed the goal to control emotions. Taken together, these results imply that holding implementation intentions does not lead to self-regulatory costs in terms of ego-depletion and supports the notion of the automaticity of implementation intentions.

With respect to the potential costs in terms of cognitive processing, it has been doubted that implementation intentions lead to automatic action initiation. To demonstrate that implementation intentions do not have *costs in terms of absorbing cognitive capacity during the initiation of an action* (i.e., automatically initiate action) requires showing not only immediate action initiation under conditions of low mental load (Gollwitzer & Brandstätter, 1997) but also under increased mental load. To test the automaticity of the action initiation, dual-task

paradigms (Heuer, 1996; Gopher & Navon, 1980; Wickens, 1980) were used. In these paradigms, participants have to work on two tasks at the same time. The hypothesis in two studies of Brandstätter, Lengfelder and Gollwitzer (2001) was that if implementation intentions towards a secondary task would interact with cognitive load, costs in form of a diminished performance in the primary task would be the consequence if mental load was high. Results revealed that action initiation in a secondary task (i.e., a go/no-go task) led to the predicted immediate action initiation in terms of a speed up when cues specified in an implementation intention were present. Furthermore, this acceleration did not occur on the cost of responding quickly to noncritical cues in the secondary task and also not on the cost of participant's performance in the primary task (i.e., memory test). Most importantly, these effects were independent of the difficulty of the primary task and thus confirmed that implementation intentions do not require much cognitive capacity but lead to an automatic initiation of the specified actions. This pattern of results was additionally replicated in the second study using the same input (visual perception) and output channel (motor response) in both tasks. Thus, there is good evidence that neither holding implementation intentions nor initiating the specified behavior requires much cognitive capacity and consequently implementation intentions hold features of automaticity (e.g., Bargh, 1994; Shiffrin & Schneider, 1977).

Beside doubts about the automaticity of implementation intentions, potential *costs in terms of low flexibility* resulting from their automaticity have been discussed. On the one hand, assuming that implementation intentions are independent of goal intentions, potential costs in form of rigid and inadequate behavior should be likely because implementation intentions would lead to automatic action initiation once the situation is encountered, even when a respective superordinate goal intention is not held. On the other hand, assuming that implementation intentions are dependent of goal intentions, they should only lead to automatic action initiation once the situation is encountered,

when a respective superordinate goal intention is actively held. Thus, potential costs in terms of rigid and inadequate behavior should become less likely if implementation intentions are dependent from the respective superordinate goal intentions. Actually, an increasing body of evidence supports the notion of the dependence of implementation intentions from goal intentions (Gollwitzer & Schaal, 1998; Sheeran et al., 2005). Thus, implementation intentions are assumed to qualify as a subcategory of *goal-dependent automaticity* (Gollwitzer & Schaal, 1998). In goal-dependent automaticity (Bargh, 1989, 1992), automatic behavior is shown in the pursuit of a set goal (e.g., hitting the brake in response to a red light, when the goal of driving a car to a final destination is held). Similarly, implementation intentions should automatically initiate a specified behavior (e.g., going running) in response to a specified situation (e.g., coming home from work), but only when the respective superordinate goal intention is held (e.g., becoming physically fit). The only differences between the two types of goal-dependent automaticity rest in the way they originate (Gollwitzer & Schaal, 1998). Whereas the goal-dependent automaticity results from the frequent and consistent pairing of situations and behaviors (Anderson, 1983, for a review, see Bargh, 1997), the *strategic automaticity* of implementation intentions is created by just a single act of will. Empirically, some evidence for an independence of implementation intentions from goal intentions was found (Gollwitzer, Heckhausen, & Ratajczak, 1990, Heckhausen & Beckmann, 1990; Steller, 1992, cited in Gollwitzer & Schaal, 1998), but most recent studies reveal that implementation intentions are dependent on the strength and activation of the respective superordinate goal intention (Seehausen et al., 1994, cited in Gollwitzer & Schaal, 1998; Sheeran et al., 2005; see section 3.1.1). Hence, implementation intentions seem to depend on the respective superordinate goal intention and therefore potential costs in terms of inadequate and rigid behavior initiations when a goal intention is *not* actively held should be rather unlikely.

In addition, potential *costs in terms of incorrect cue discrimination* resulting from implementation intentions have been addressed by previous research (Webb & Sheeran, 2004). To address this question Webb and Sheeran conducted two studies (Webb & Sheeran, 2004, Study 2 and 3). They used a dual-task paradigm similar to the one of Brandstätter et al. (2001, described above). In addition to the specific situational cue of the implementation intention (i.e., the number 3) and non-critical cues (e.g., the numbers 9, 44, 555, 694), they included ambiguous cues (i.e., the numbers 33, 333, 39, 413) in the task. Results indicated that implementation intentions led to the predicted speed up effects only in the responses to the exact implementation intention cue but not to costs in terms of an increase of false positive (Study 2) or slower responses to non-critical or ambiguous stimuli (Study 3). Hence, first evidence is available that implementation intentions do not lead to costs with regard to the accuracy of cue discrimination.

Finally, implementation intentions have been suggested to produce *costs in terms of rebound effects in mental control* (Gollwitzer et al., 2005). That is, conscious attempts to control unwanted thoughts increase the accessibility of these unwanted thoughts and thus the likelihood that these unwanted behaviors surface in subsequent thoughts and behavior. In two studies rebound effects of implementation intentions were tested (Gollwitzer et al., 2002, cited in Gollwitzer et al., 2005). Participants who furnished their goal intention to suppress stereotypic thoughts about homeless people with an implementation intention used less stereotypic descriptions when writing a statement about their impression of homeless people. In addition, they showed less rebound in a subsequent semantic differential type questionnaire that contained five pairs in relation to the stereotype of homeless people (e.g., drunk – sober, busy- lazy) than participants who only held a goal intention. In a second study rebound was measured in a lexical decision task. Whereas participants who formed a goal intention to not stereotype were faster in identifying stereotypes as words as

compared to non-words in the lexical decision task, participants who furnished their goal with implementation intentions did not show such speed ups to stereotypic words. In sum, implementation intentions are suggested to shield a person's conscious mental states from rebound effects because "the links between the critical situation and the response serves to isolate the plan from present internal states or external conditions, the plan runs off in an effortless, efficient manner, and does not tax cognitive resources (of the conscious operating system)", (Gollwitzer et al., 2005, p. 509).

In sum, limitations of implementation intentions were found in form of heterogeneous results on the effectiveness of implementation intentions in overcoming unwanted habits (i.e., overcoming unhealthy eating habits, routinized decision making) and costs were found in the form of biased behavior in easy tasks (i.e., hampered performance if they are formed for easy tasks) that were not noticed (i.e., participants did not disengage from ineffective implementation intentions). No costs of implementation intentions have been found in terms of depleting self-regulatory resources, inadequate action initiation when the respective superordinate goal intention is not actively held or when ambiguous cues are present during goal pursuit. Furthermore, no costs in terms of rebound effects in mental control have been found. Without doubt the reported limitations and costs do not outweigh the impressive evidence of the benefits of implementation intentions, but they underline the necessity to systematically examine potential side effects implementation intentions might have for goal pursuit.

3.4 Side effects of implementation intentions

Research on the costs of implementation intentions focused on the automaticity of implementation intentions and their consequences. Thereby, it

was demonstrated that implementation intentions lead to *enhanced detection of situational cues* and to *automatic action initiation*. These automatic effects have been argued not to lead to costs because two preconditions have to be fulfilled:

First, the automaticity of implementation intentions results from a single act of will. That is, people intentionally define situations in which the automatic action initiation should help them to achieve their goals. This intentional causation of the automatic effects is referred to as *strategic automaticity* (Gollwitzer & Schaal, 1998) of implementation intentions.

Second, implementation intentions are assumed to depend on the actual state of the superordinate goal intention. That is, implementation intentions should unfold their automatic effects only when the superordinate goal is actively held. This specification of the automaticity of implementation intentions has been named as a subcategory of *goal-dependent automaticity* (Gollwitzer & Schaal, 1998; Sheeran et al., 2005).

The first precondition that the specified situational cues have to be present to elicit the automatic effects of implementation intentions is fully agreed by the present examination of potential costs as a side effect of implementation intentions. The main critic of the present thesis is directed at the second assumption that the goal-dependent automaticity of implementation intentions prevents potential side effects. Implicit in this argumentation and in previous research is the assumption that *only one goal intention* is actively held at a time and thus inadequate effects of implementation intentions are rather unlikely. But knowing that successful goal pursuit often requires that a goal is actively held over longer time periods and thus that often *more than one goal* is actively held (Kruglanski et al., 2002), the goal-dependent automaticity of implementation intentions should not be sufficient to prevent potential negative side effects. Consequently, if the superordinate goal intention of an

implementation intention is actively held, automatic effects of implementation intentions should be possible even during the pursuit of other goals.

That is, as long as the superordinate goal intentions are actively held (e.g., being friendly to people), situational cues (e.g., a person) can be assumed to automatically attract attention and initiate the behavior specified in the implementation intention (e.g., starting to talk to a person), even if a other goal is actually pursued (e.g., concentrating on writing up a journal article).

Unlike the intended effects of implementation intentions for the respective goal pursuit, automatic effects of implementation intentions during the pursuit of other goals would be *unintended side effects of implementation intentions*. Up to date, there has been no systematic theoretical exploration or empirical testing of the possibility that implementation intentions lead to side effects when the respective superordinate goal intention is actively held and their cues are present as additional cues during the pursuit of another goal. Therefore, it is the aim of the current research to examine if the presence of specified situational cues during the pursuit of another goal leads to costs of implementation intentions as an unintended side effect. Derived from previous research on the processes underlying the effects of implementation intentions (Gollwitzer & Schaal, 1998; Gollwitzer & Sheeran, 2006), these negative side effects are expected in form of attentional consequences (resulting from the specified situation, see section 3.3.1, 4) as well as behavioral consequences (resulting from the specified behavior, see section 3.3.2, 5).

3.4.1 Attentional side effects caused by situational cues

Attentional processes have been assumed to be part of the processes that underlie the effects of implementation intentions (see section 3.1.2). That is, implementation intention cues should not escape people's attention and thus good opportunities to act should not easily be missed. But knowing that

attention is a limited source (Shiffrin & Schneider, 1977; Wickens, 1980), the automatic attraction of attention through implementation intentions is likely to lead to costs in terms of reduced attentional resources that are left to attend to other cues. Transferring this process to situations where an implementation intention as well as the respective superordinate goal intention is actively held, the presence of situational cues specified in this implementation intention should attract attention, even during the pursuit of other goals. Consequently, less attentional resources remain for the goal that is actually pursued and a diminished goal attainment should result. Therefore, the first aim of the present research is to examine if implementation intentions attract people's attention, even during the pursuit of another goal and if this automatic attraction of attention results in diminished goal attainment as a side effect of implementation intentions. Attention attraction effects (i.e., disruption of the focal task by a situational cue from the implementation intention) would be evidenced by diminished performances in simultaneous measurement in contexts with more than one important task dimension (Study 1) and in sequential measurement in different tasks (Study 2 & 3). Additionally, a positive relation between attention attraction effects and improved performance effects of implementation intentions would be expected (Study 3). If more attentional attraction co-occurs with improved implementation intention performances in a separate task this would point to identical processes underlying benefits as well as costs of implementation intentions.

3.4.2 Behavioral side effects caused by automatic action initiation

Following Gollwitzer (1999, p. 501), "rigidity as a result of implementation intentions is to be expected, however, when the specified situation is actually encountered, but this type of rigidity is functional, because it protects an ongoing goal pursuit from intrusions". Whereas this assumption of the functionality of the rigidity of implementation intentions (i.e., automatic action initiation) speaks to a constellation where the specified situation is present

during the pursuit of the respective goal, the previous theorizing is silent on potential side effects of this rigidity of implementation intentions, if the specified situation is present during the pursuit of other goals. Therefore, the second research goal of the present research was to test whether the automaticity of implementation intentions leads to behavioral side effects if parts of the situation specified in the implementation intention are present during the pursuit of another goal. These negative side effects would be evidenced by a generalization of behaviors that are specified in the implementation intention to behaviors directed at other goals, when the specified situational cues are present as additional cues during the pursuit of another goal. Such negative side effects of implementation intentions (i.e., biased behavior in a task when situational cues of an implementation intention that was formed for another goal are present) would be expected for judgments in social contexts. In these contexts, social comparisons have been demonstrated to moderate the direction of automatic behavior (e.g., Schubert & Häfner, 2003). Similarly, the automaticity of implementation intentions was expected to lead to overgeneralization of the behavior specified in the implementation intention in contexts where no social comparisons take place (Study 4). Judgments of a different social group should be endorsed in the direction of the behavior specified in a group-directed implementation intention (i.e., overgeneralization) when the situational cue is present. In contexts where social comparisons take place (Study 5), contrasting behavior was expected. Judgments of a different social group should be endorsed in the opposite direction of the behavior specified in the implementation intention (i.e., contrast) when the situational cue is present.

3.5 Overview of the present research

Two series of studies were conducted to examine attentional and behavioral side effects of implementation intentions. In the first series, attention

attraction effects of implementation intentions have been examined during the pursuit of other goals. In three studies, situational cues of an implementation intention have been presented during the pursuit of other goals. The attraction of attention was indicated by a diminished performance on the performance dimension that was unrelated to the implementation intention (i.e., simultaneous measurement, Study 1) or by a diminished performance on a separate task (sequential measurement, Study 2, 3).

In the second series of studies, behavioral side effects of implementation intentions were investigated in form of biased judgments of unrelated social groups. In two studies, situational cues of an unrelated implementation intention were present during the pursuit of other goals. The generalization of the behavior specified in the implementation intention during the pursuit of another goal was indicated by the endorsement of judgments of an unrelated social group in the direction of the behavior specified in the implementation intention as overgeneralization (Study 4) or in the opposite direction as contrast behavior (Study 5).

4 IMPLEMENTATION INTENTIONS AND ATTENTIONAL SIDE EFFECTS¹

4.1 Attentional effects of implementation intentions

How could it be shown that situational cues of an implementation intention attract attention more easily than situational cues that are not included in an implementation intention? It is hard to assess the current focus of attention directly, but research has demonstrated that human attention is limited in capacity (Shiffrin & Schneider, 1977; Wickens, 1980). In other words: If attentional resources are attracted by the situational cue (X), less attention can be paid to other information. Hence, responses to other information diminish (i.e., slow down in most of the paradigms). Several paradigms make use of this effect to measure the attention attracted by distractors (Eriksen & Eriksen, 1974; Johnston & Heinz, 1978).

Using the dichotomic listening task (Johnston & Heinz, 1978), the only research addressing the impact of implementation intentions on attention found that the situational cue specified in an implementation intention was disruptive to focused attention (Steller, 1992, cited in Gollwitzer, 1993). In this task, participants had to shadow (repeat) words that were presented on one ear (attended channel) and to ignore words presented on the other ear (non-attended channel). In addition to this dichotomic listening task they had to turn off a probe light that was flashing in irregular intervals as a subsidiary second task. It was found that the shadowing performance and the response speed on the subsidiary second task were diminished if situational cues from implementation intentions were presented on a non-attended channel. In two

¹ This section has been modified and submitted for publication (Wieber & Sassenberg, 2006).

studies these distracting effects were only found for participants holding the relevant goal intention *and* the implementation intention, but not for participants in a control condition. The control group *neither* formed the relevant goal intention *nor* the implementation intention. In sum, these results nicely demonstrate that situational cues attract people's attention even during the pursuit of other goals, if a goal intention and an implementation intention including these cues have been formed. However, these studies do not reveal if just a goal intention or a goal intention plus an implementation intention is necessary for the effect on attention as both levels of attention have been confounded in the manipulations of Steller (1992, cited in Gollwitzer, 1993).

Recent findings by Moskowitz (2002) question whether the implementation intention is driving the attention attraction effect in the studies of Steller (1992, cited in Gollwitzer, 1993). Moskowitz found differences in attention attraction between cues for uncompleted and completed goals (i.e., goals, participants had subjectively not fully achieved or successfully achieved, respectively). Only when goals were not fully completed (i.e., participants still hold a goal intention), cues associated with these goals attracted attention, even during the pursuit of a focal task (i.e., slowed down responses). The cues used by Moskowitz (2002) were semantic associations of the goal and not situational cues, but means and other associations such as situational cues are stored in a common cognitive network just like all other mental representations (Kruglanski et al., 2002; Moskowitz, Salomon, & Taylor, 2000; Shah, 2003). Thus, the effects found by Moskowitz (2002) will most likely also be found for relevant situational cues. In sum, findings suggest that cues relevant for an uncompleted goal already attract attention.

What conclusions can be drawn from a comparison of the studies by Steller (1992, cited in Gollwitzer, 1993) and Moskowitz (2002)? Steller's research found attention attraction effects in participants who formed a goal

intention and an implementation intention but not in participants that held neither. In Moskowitz's research (2002) goals without implementation intentions were also found to impact on attention. Hence, the effect of goal intentions might fully account for the attention attraction effects reported by Steller (1992, cited in Gollwitzer, 1993). Therefore, it cannot be concluded from the existing research, whether an implementation intention contributes above and beyond a goal intention to attention attraction effects.

It is the aim of the present research to examine the effect implementation intentions have beyond goal intentions on attention to the situational cues they specify. Following the assumption of Gollwitzer and Schaal (1998) it was predicted that implementation intentions attract attention above and beyond goal intentions. As an indicator of these attention attraction effects, the attention towards other cues and thus the pursuit of other goals is expected to be diminished. Less attentional resources should remain if implementation intention cues occupy parts of our limited attentional capacity.

Second, a positive relation between the attention attracted by the situational cues from implementation intentions and improved goal attainment from the same intention is predicted, because the attention to situational cues is the first step towards action initiation.

Overview of studies on attentional side effects of implementation intentions

The present research examines whether the situational cues (X) attract more attention after forming an implementation intention (compared to only holding the goal intention the implementation intention is based on). To measure attention attraction, implementation intention cues appeared during the pursuit of competing (sub)goals. In Study 1, attention attraction effects of implementation intentions compared to goal intentions were examined in an attention-concentration task. Whereas the implementation intention was

directed at one subgoal of this task, the predicted diminished performance through the attraction of attention was measured concerning a different subgoal that was pursued simultaneously. To avoid the direct competition of the two subgoals, Study 2 and 3 assessed the impact of forming an implementation intention on attention towards the situational cue during the pursuit of another goal. Moreover, to examine the relation between attention attraction effects and improved performance effects (i.e., the actual benefits of implementation intentions), Study 3 measured attention attraction effects and improved performance resulting from implementation intentions one after the other.

4.2 Study 1

In Study 1 an attention-concentration task in which overall good performance required the pursuit of two subgoals was used to examine attention attraction by situational cues from implementation intentions. The two subgoals were to mark two types of signs between numerous similar other signs, namely the letter *d* with two lines above or below and the letter *p* with one line above or below in a restricted amount of time. In the experimental condition, one subgoal was furnished with an implementation intention (marking *ds* with two lines), whereas the other subgoal was not (marking *ps* with one line). The attention attraction effect from the implementation intention was expected to increase performance for the subgoal to mark the critical *ds*, but to diminish the performance for the subgoal to mark the critical *ps* (compared respectively to the performance in a control condition where participants held both subgoals but no implementation intention). The latter was expected, because in the current task the limited attention resources were expected to be attracted by the critical *ds* and, thus, distracted from the critical *ps*. In sum, for participants in the implementation intention condition fewer hits and more misses on critical *ps* were predicted than in the control condition. At the same

time, the implementation intentions were hypothesized to result in more hits and fewer misses for critical *ds*.

4.2.1 Method

Design and Participants

An experiment with a mixed 2 x 2 design with Intention (implementation intention vs. control intention) as between-subjects factor and Sign (*ps* with one line, *ds* with two lines) as within-subjects factor was conducted. Twenty-six female and 15 male undergraduate students of the Friedrich-Schiller-University of Jena (Germany) with a mean age of 22 years (range 19-28) took part in the experiment in exchange for 5 €.

Procedure

Three to six participants attended per session. Before the actual task started, participants ostensibly received “training” that actually served as a manipulation of the Intention (see below). The instruction informed them that the administered test is often used in personal assessment to increase the task relevance. Additionally, 10 € were awarded to the three participants showing the best overall task performance to increase motivation. First, participants worked through an example to raise awareness for the task difficulty (given the time restriction). Then, participants simultaneously started to work on the concentration test. A modified D2 attention-concentration task (Brickenkamp, 1978) served to measure the effects of implementations intentions on the pursuit of the two subgoals. The test consists of 14 rows of *ds* and *ps* with different numbers of lines above and/or below. Each row is composed of 47 signs. In the original D2 task participants have to mark all *ds* with two lines only, whereas our participants had to mark additionally *ps* with one line to include a second subgoal. Hence, the following signs had to be marked: $\overset{..}{d}$, $\overset{.}{d}$, $\underset{.}{d}$, $\underset{..}{p}$, $\overset{.}{p}$.

The time for each row was restricted to 25 seconds. Afterwards the experimenter gave a signal indicating that the next row should be started. Because of the time restriction, it is hardly possible to mark all critical letters and the task requires full attention for good performance. Hence, forming an implementation intention for one subgoal (e.g., critical *ds*) should be especially beneficial for the pursuit of this subgoal, when implementation intentions cause attention attraction effects. At the same time, the performance on the second subgoal should diminish, as the attention is distracted from the other critical cue. Finally, they worked through a short questionnaire, were debriefed, paid, and thanked.

Manipulation

The “training” that served as a manipulation of Intention requested participants to memorize three intentions. On the subsequent page they were asked to remember these intentions and to write them down. In the implementation intention condition these intentions specified when to act in order to mark all critical *ds* (“If I see a *d* with two lines above ($\overset{\overset{\text{..}}{\text{..}}}{d}$), I mark it“, “If I see a *d* with two lines below ($\underset{\underset{\text{..}}{\text{..}}}{d}$), I mark it“, “If I see a *d* with one line above and one line below ($\overset{\overset{\text{.}}{\text{.}}}{\underset{\underset{\text{.}}{\text{.}}}{d}}$), I mark it“). Thus, the intentions referred only to the critical *ds*. Although the critical *ps* were part of the general task instructions and described as equally important, they were not included in the implementation intentions to allow for measuring the attention attraction of critical *ds* on the performance on the second subgoal (critical *ps*). In the control intention condition the three intentions neither referred to critical *ps* nor to critical *ds* (“I will try to solve the task as well as possible“, “I will try to solve the task as quickly as possible“, and “I will try to solve the task as accurately as possible“). These control intentions were chosen to avoid influences on the relation between the subgoals. Thus, the instructions towards the critical *ps* were identical in both conditions. The critical *ds* were part of a goal and an implementation intention in the implementation intention condition but only part

of a goal in the control intention condition. In both conditions it was once again clearly stated just before the task that participants were to mark both types of signs.

Measures

Motivation: Before participants started with the D2 task, they had to indicate their motivation for the upcoming task on a 7-point scale (“How important is it to you to perform as well as possible on the following task?”, 1 (*unimportant*) to 7 (*very important*)).

Performance: Attention attraction was assessed using performance in the attention-concentration task. For critical *ps* and *ds*, hits (i.e., correctly marked signs) and misses (i.e., critical signs that were not marked) were counted separately. Misses were counted relatively to the individual’s performance. That is, in each row misses were counted only within the range from the beginning of a row to the last correctly marked sign in this row.

Additional checks: In the final questionnaire the perceived performance, distraction, task difficulty, effect of the “training” and control questions were administered [“How do you rate your performance on *ps* with one line / *ds* with two lines?”, 1 (*very low*) to 7 (*very high*); “Did you have many distracting thoughts during the task?”, 1 (*very little distracting thoughts*) to 7 (*many distracting thoughts*); “How difficult was the task for you?”, 1 (*difficult*) to 7 (*easy*), “Were the intentions formed in the training helpful for the task?”, 1 (*not helpful at all*) to 7 (*very helpful*); “Did you concentrate more on the *ds* or on the *ps* during the task?”, 1 (*concentrated more on ds*) to 7 (*concentrated more on ps*); “How important was it to you to perform as well as possible in the concentration task?”, 1 (*not important at all*) to 7 (*very important*); “How quick were you?”, 1 (*not quick at all*) to 7 (*very quick*)].

4.2.2 Results

The *motivation measure* revealed no differences between stated motivation after the training in either condition, $F(1, 39) < .86$; $p = .357$, $\eta^2_p < .022$. Participants in the implementation intention condition ($M = 5.75$, $SD = 1.25$) as well as in the control intention condition ($M = 5.38$, $SD = 1.28$) were highly motivated to perform as well as possible.

For *performance*, it was predicted that participants in the implementation intention condition show a diminished performance on critical *ps* (less hits, more misses) and an improved performance on critical *ds* (more hits, less misses) compared to the control intention condition. To test these predictions, separate χ^2 tests for critical *ps* and critical *ds* with hits and misses and the two intention conditions (implementation intention vs. control intention) were computed.

Table 1: Mean hits and misses (standard deviations) per person for critical ds with two lines and critical ps with one line in the D2 task as a function of Intention (Study 1, N = 41).

	D2 Task - Hits		D2 Task - Misses	
	Implementation intention condition	Control intention condition	Implementation intention condition	Control intention condition
Critical <i>ds</i>	167.35 (31.42)	162.38 (43.32)	130.65 (31.42)	135.62 (43.32)
Critical <i>ps</i>	34.95 (13.36)	40.57 (4.51)	16.05 (13.36)	10.43 (4.51)

As predicted, the performance on critical *ps* showed a significant difference between conditions, $\chi^2(1, N = 41) = 9.60; p < .001$ (see Table 1). Participants in the implementation intention condition had less hits ($M = 34.95^2$, $SD = 13.36$) and more misses ($M = 16.05$, $SD = 13.36$) on critical *ps* than participants in the control intention condition (hits: $M = 40.57$, $SD = 4.51$; misses: $M = 10.43$, $SD = 4.51$). In addition, the performance on critical *ds* tended to differ between conditions, $\chi^2(1, N = 41) = 3.43, p = .010$. Participants in the implementation intention condition marked more *ds* correctly ($M = 167.35$, $SD = 31.42$) and missed less critical *ds* ($M = 130.65$, $SD = 31.42$) than participants in the control intention condition (hits: $M = 162.38$, $SD = 43.32$; misses: $M = 135.62$, $SD = 43.32$).

Closer inspection of the data showed that two participants in the implementation intention condition left out all critical *ps*. This might indicate that they did not see the critical *ps* as important even though the instructions asked them to mark both types of letters several times. After excluding these two participants, a marginal difference between conditions on hits and misses for critical *ps* remained, $\chi^2(1, N = 39) = 2.99; p = .10$. Participants in the implementation intention condition showed a tendency to have less hits ($M = 38.83$, $SD = 6.31$) and more misses ($M = 4.78$, $SD = 5.49$) critical *ps* compared to participants in the control intention condition (hits: $M = 40.57$, $SD = 4.51$; misses: $M = 3.76$, $SD = 4.38$). For critical *ds* the differences between conditions on hits and misses remained, $\chi^2(1, N = 39) = 42.40; p < .001$. Participants in the implementation intention condition had more hits ($M = 166.06$, $SD = 32.94$) and less misses ($M = 20.28$, $SD = 26.25$) critical *ds* compared to participants in the control intention condition (hits: $M = 162.38$, $SD = 43.32$; misses: $M = 31.19$, $SD = 43.78$).

² For the sake of reading convenience, participants mean numbers of marked and missed cues for *ps* and *ds* in the D2 task are reported, whereas the test was based on sums within conditions.

The results of the *final questionnaire* revealed no differences between conditions, all F s < 1.2, all p s > .25, all η^2_p < .03. Participants did not differ between conditions in their perception of performance, distractions, task difficulty or the impact of the training (“How do you rate your performance on ps with one line?”, $M_{implementation\ intention; (ij)} = 4.60$, $SD_{ij} = 1.23$, $M_{control\ intention; (ci)} = 4.62$, $SD_{ci} = 1.28$; “How do you rate your performance on ds with two lines?”, $M_{ij} = 3.45$; $SD_{ij} = 1.40$, $M_{ci} = 3.86$, $SD_{ci} = 1.53$; “How quick have you been?”, $M_{ij} = 3.70$, $SD_{ij} = 1.03$, $M_{ci} = 3.71$, $SD_{ci} = 1.79$; “Did you have many distracting thoughts during the task?”, $M_{ij} = 2.65$, $SD_{ij} = 1.53$, $M_{ci} = 2.48$, $SD_{ci} = 1.44$; “How difficult was the task for you?”, $M_{ij} = 4.50$, $SD_{ij} = 1.40$, $M_{ci} = 4.48$, $SD_{ci} = 1.50$; “Were the intentions formed in the training helpful for the task?”, $M_{ij} = 3.21$, $SD_{ij} = 1.72$, $M_{ci} = 3.14$, $SD_{ci} = 1.46$). Most importantly, participants in the implementation intention condition ($M = 2.65$, $SD = 1.26$) did not report that they focused more on ds than on ps compared to participants in the control intention condition ($M = 3.14$, $SD = 1.68$). Finally, stated motivation replicated the findings of the motivation measure. Overall it was high and did not differ between conditions (“How important was it to you to perform as well as possible in the concentration task?”, $M_{ij} = 5.75$, $SD_{ij} = 1.25$, $M_{ci} = 5.38$, $SD_{ci} = 1.28$).

4.2.3 Discussion

In this Study, first evidence for attention attraction effects from implementation intentions beyond goals was found in an attention-concentration task. Forming an implementation intention for one subgoal (ds) led to diminished performance for the second subgoal (ps) that was not furnished with an implementation intention (compared to a control condition without any implementation intentions). In addition to these attention attraction effects of implementation intentions, improved performance was shown for the subgoal the implementation intention was formed for. No differences between conditions were found concerning the motivation, the perceived effectiveness of the training (i.e., formed intention) and other self-report measures.

However, Study 1 has at least two limitations. First, the intention conditions did not contain the same information. Whereas the critical *ds* were part of three intentions in the implementation intention condition, they were not included in the intentions of the control intention condition. Thus, it cannot be excluded that the accessibility of the critical cues differed between the intention conditions. To control for accessibility effects, both intention conditions should contain the same information with regard to the situational cues of the implementation intention.

Second, two participants did not mark any of the critical *ps*. This could be a result of differences in perceived importance attributed to the two subgoals, which might have been reinforced by a characteristic of the materials: There were far more critical *ds* than critical *ps*. Thus, the effects found in Study 1 cannot unequivocally be attributed to attention. To rule this out, attention attraction effects and improved performance effects of implementation intentions will be measured in separate tasks in the following two studies.

4.3 Study 2

To further examine attention attraction effects of implementation intentions and to address the limitations of Study 1 a second study was conducted. An improved manipulation with identical information in both intention conditions was used to control for the accessibility of the situational cues. To avoid a bias towards the goals furnished with an implementation intention, attention attraction effects were measured in a different task than the one the implementation intentions were formed for. Finally, a more fine-grained attention measure than in Study 1 was used.

It was predicted that attention towards lexical decisions would be disrupted if unrelated situational cues from implementation intentions formed for

a different task were present as irrelevant cues, because these cues attract attention. Hence, slower reaction times in the lexical decisions were expected in the implementation intention condition compared to the control condition if a situational cue was present, but not when neutral cues were present.

4.3.1 Method

Design and Participants

Study 2 had a mixed 2 x 2 design with Intention (implementation intention vs. control intention) as a between-subjects factor and Distractor (critical distractor, neutral distractor) as a within-subjects factor. Twenty-one female and six male undergraduate students of the Friedrich-Schiller-University Jena with a mean age of 23 years (range 18-28) took part in the experiment in exchange for 5 €.

Procedure

Upon arrival at the laboratory, participants were seated in front of a computer and were informed that they would work on two different studies combined for convenience. First, participants worked on a categorization task that served to motivate the formation of a goal.

The categorization task was similar to the musical instrument and weapon implicit association test (Greenwald, McGhee, & Schwarz, 1998). Participants had to categorize cues by pressing either the left or the right control key on a computer keyboard. The task consisted of 10 trials where words had to be categorized as pleasant versus unpleasant, 10 trials where words had to be categorized as music instrument or weapon and 20 trials with the value-incongruent combinations of music instruments and unpleasant words

on one key and weapons as well as pleasant words on the other key³. Participants generally experience the value incongruent trials of an implicit association test as difficult (Monteith, Voils, & Ashburn-Nado, 2001). This experience was used to motivate participants to train before carrying out the categorization task a second time. This training was in fact the intention manipulation (see below). After the training, participants worked on a seemingly unrelated Study, which was in fact the assessment of the attention attraction effect. This intersection was justified by telling participants that the training would take some time to enfold its optimal effects. After the assessment of the attention attraction, participants filled in a short questionnaire. The announced repetition of the first categorization task was actually not included in the Study. Finally, participants were thoroughly debriefed, paid and thanked.

Manipulation

To manipulate participant's intentions, they were "trained" for the inconsistent trials of an implicit association task on flowers and insects.⁴ In both conditions they formed the goal to press the left control key, if they see a flower or an unpleasant word and to press the right control key, if they see an insect or a pleasant word. In the *implementation intention condition*, participants had to memorize four implementation intentions ("If I see an 'unpleasant' word, I press the left control key." "If I see a 'pleasant' word, I press the right control key.", "If I see a 'flower', I press the left control key.", "If I see an 'insect', I press the right control key. "). In the *control intention condition* participants furnished the goal

³ The congruent block and the relearning phase of the original implicit association test were not included, to keep the key that had to be pressed for a category constant throughout the whole study. This was necessary to allow forming an implementation intention for a category key (e.g., left control key for music instruments, right control key for weapons) that is true during all trials of the task.

⁴ The training used different categories (flowers, insects) than the first categorization task (music-instruments, weapons). This change of categories served to avoid a heightened accessibility of the cues through the repeated activation in the first categorization task before the attention attraction measurement.

with six control intentions (“I respond to a ‘flower’ as quickly and accurate as possible”, “I respond to an ‘insect’ as quickly and accurate as possible”, “I respond to an ‘unpleasant’ word as quickly and accurate as possible”, “I respond to a ‘pleasant’ word as quickly and accurate as possible”, “I press the left control key as quickly and accurate as possible”, “I press the right control key as quickly and accurate as possible.”). Thus, the situational cues of the implementation intentions (“*flower*”, “*insect*”, pleasant word, and unpleasant word) were included in the control intentions as well as in the implementation intentions as an attempt to control the accessibility of these cues between conditions. On the subsequent page, participants had to write down the memorized intentions. This part of the instructions was given on paper, whereas the rest of the Study was conducted at the computer.

Measures

Attention attraction: To measure *attention attraction effects* independently of performance effects of implementation intentions, a modified flanker task (Eriksen & Eriksen, 1974) was employed. In this task participants were presented with two cues on the computer screen. One cue was written in non-italic letters (distractor) and one in italic letters (target). Participant’s task was to decide if the cue written in italic letters (target) was a word or a non-word (e.g., *cup*, *vase*, *vehicle*, *meirn*, *berse*, *felerod*) by pressing either the left or the right control key. Thus, only the targets were relevant for the task. Including the target type as a factor in the analyses reported below did not lead to any significant effects involving this factor or to any changes in the reported results. Therefore, target type was not included in analyses reported below. Regarding the distractors participants were told that they were just to increase the complexity of the task and should thus be ignored. But in fact the distractor cues served to operationalize the Distractor factor: Neutral distractors were neutral words (e.g., *clothing*, *vase*); critical distractors were the situational cues

from the implementation intentions (*flower*, *insect*). In addition, non-words (e.g., *felerod*, *geluit*) were presented as distractors to support the plausibility of the cover story. The extent to which the response speed in this lexical decision task differs between trials with a critical distractor versus a neutral distractor indicates the attention attraction effect of the critical distractor.

Targets and distractors were placed vertically in the center of the screen (17 inch, 1024 x 768 dots) in 24 pt letters with double spacing between them. Overall, the flanker task consisted of 10 practice trials plus 64 trials. Each trial started 250 ms after the preceding trial with a fixation cross that was presented for 500 ms. Targets as well as distractors consisted of 32 words and 32 non-words. The distractors contained 8 critical words and 24 neutral words.

Two indices were calculated from the response time data. A neutral distractor index was computed using the mean reaction times to target cues (words and non-words) simultaneously present with a neutral distractor (neutral words). The critical distractor index consisted of the mean reaction times to target cues (words and non-words) that were simultaneously present with a critical word as distractor (i.e., the situational cues *flower* and *insect*).

Final questionnaire: To control for intentional strategies the following questions were asked: “Did the training influence your performance on the word-or non-word task?” [1 (*not at all*) to 9 (*very much*)], “Did you have distracting thoughts that hindered you during the word or non-word task?” [1 (*very little distracting thoughts*) to 9 (*many distracting thoughts*)], “How concentrated were you during the tasks?” [1 (*not concentrated at all*) to 7 (*very concentrated*)], “How quick were you?” [1 (*not quick at all*) to 7 (*very quick*)] and “How difficult was the tasks for you overall?” [1 (*difficult*) to 7 (*easy*)].

4.3.2 Results

Flanker task

For the analysis of the flanker task all responses faster than 150 ms, more than 2 standard deviations slower than the mean response time (> 1660 ms), or were incorrect were omitted from the analyses reported below (overall 15.12 percent of the trials). Error rates in the flanker task did not differ between conditions ($M_{ij} = 11.92$, $SD_{ij} = 7.65$, $M_{ci} = 8.29$, $SD_{ci} = 4.87$), $F(1, 25) = 2.20$, $p = .15$, $\eta^2_p = .081$.

In order to test the predictions towards the attention attraction effects of intentions, a mixed MANCOVA was calculated with Intention (implementation intention vs. control intention) as between-subjects factor, Distractor (critical distractor, neutral distractor) as within-subjects factor, and the mean reaction time of the residual trials that were not included in the critical comparison (i.e., non-word distractors) as covariate to control for interindividual differences in mean response times⁵.

Table 2: Mean estimates (standard deviations) of response times from the flanker task as a function of Intention and Distractor (Study 2, N = 27).

	Implementation intention condition	Control intention condition
Flanker task		
Critical distractors	1048.29 (81.02) ^a	982.72 (80.97) ^b
Neutral distractors	998.81 (33.93)	986.78 (33.94)

Note: Within rows, means having different superscripts^{a b} differ significantly at a level of $p < .05$.

⁵ There was a main effect of the covariate, $F(1, 24) = 290.39$, $p < .001$, $\eta^2_p = .924$, which implies that the mean response times differed between participants. No interaction between this covariate and distractor, $F(1, 24) = .39$, $p = .537$, $\eta^2_p = .016$ and no main effect of condition was found, $F(1, 24) = 3.05$, $p = .094$, $\eta^2_p = .113$.

The expected Intention x Distractor interaction was found, $F(1, 24) = 4.35$, $p = .048$, $\eta^2_p = .153$ (see Table 2). In line with the predictions, pairwise comparisons revealed that reactions to target cues appearing simultaneously with critical distractors took longer in the implementation intention condition ($M = 1048.29$ ms, $SD = 81.02$) than in the control intention condition ($M = 982.72$ ms, $SD = 80.97$), $F(1, 24) = 4.34$, $p = .048$, $\eta^2_p = .153$. No differences in reactions between the implementation intention ($M = 998.81$ ms, $SD = 33.93$) and the control intention condition ($M = 986.78$ ms, $SD = 33.94$) occurred when neutral distractors simultaneously appeared with target cues, $F(1, 24) = 1.06$, $p = .314$, $\eta^2_p = .042$.

Questionnaire

The items of the final questionnaire revealed no differences between conditions, all $F_s(1, 25) < 0.25$. Participants in the implementation intention condition as well as in the control intention condition did perceive few attention attraction ("Did the training influence your performance on the word-or non-word task?", $M_{ii} = 3.54$, $SD_{ii} = 2.60$, $M_{ci} = 3.13$, $SD_{ci} = 1.69$; "Did you have distracting thoughts that hindered you during the word or non-word task?", $M_{ii} = 2.69$, $SD_{ii} = 1.75$, $M_{ci} = 3.00$, $SD_{ci} = 1.89$) and did not differ on the control questions ("How concentrated were you during the tasks?", $M_{ii} = 6.54$, $SD_{ii} = 1.45$, $M_{ci} = 6.80$, $SD_{ci} = 1.32$; "How quick were you overall?", $M_{ii} = 5.69$, $SD_{ii} = 1.18$, $M_{ci} = 5.80$, $SD_{ci} = 1.82$; "How difficult were the tasks for you overall?", $M_{ii} = 6.15$, $SD_{ii} = 1.91$, $M_{ci} = 6.27$, $SD_{ci} = 1.91$).

Discussion

In Study 2 situational cues from implementation intentions attracted attention, when they appeared as distractors during the pursuit of another goal. Participants' responses slowed down when a situational cue from an implementation intention appeared close to a target stimulus. This was found

comparing participants holding a goal furnished with an implementation intention with participants holding only the goal. Both groups did not differ in their response speed when other distractors were shown. Self-reports again suggested that participants were not aware of attention attraction effects of implementation intentions at least not more than when holding a goal intention. In sum, this Study replicates the attention attraction effects of situational cues from implementation intentions. At the same time, the two main limitations of Study 1 were ruled out in this Study: The two subgoals were not pursued at the same time and the two conditions were parallel in terms of the content of the intentions.

Nonetheless, Study 2 leaves two open questions. First, it does not provide evidence for the functionality of the implementation intentions and the relation between the attention attraction effect and the improved performance from implementation intentions. Second, the same behavior (pressing control keys) the implementation intention was formed for had to be elicited in the flanker task. Thus, the distraction in the flanker task might be limited to behavior included in the implementation intention.

4.4 Study 3

Study 3 was designed to examine the relation between attention attraction effects and improved performance from implementation intentions. At the same time, this Study aimed to test whether the attention attraction effect of implementation intentions is limited to cases where the behavior specified in the implementation intention had to be shown to pursue another goal as in Study 2. However, it was expected that the attention attraction effect of situational cues from implementation intentions would generalize to situations where any behavior is shown.

To test this prediction, the task and the goal the implementation intention was formed for was different from Study 2. Moreover, the flanker task had to be adjusted. This time participants formed an implementation intention for a letter detection task in which participants are asked to mark instances of a certain letter in a printout of a text with a pen. Usually, a lot of letters are overlooked because texts are not processed letter by letter but simple words are recognized as a whole (i.e., missing-letter effect, Healy, 1994). Webb and Sheeran (2004) provided evidence that implementation intentions improve the performance in this task substantially. As in Study 2, participants first formed implementation intentions for the letter detection task, then they worked on the flanker task and finally, they had to mark all *ds* in a short text.

When an implementation intention cue (*D/d*), was present as distractor in the flanker task, slower reactions were expected in the implementation intention compared to the control intention condition. No performance differences between conditions should occur, when a neutral cue was present as distractor. Thus, an Intention by Distractor interaction was predicted. For the letter detection task, an improved performance was expected in the implementation intention condition compared to the control intention condition. Finally, a positive correlation between the extent of attention attraction in the flanker task and the performance in the letter detection task was expected.

4.4.1 Method

Design and Participants

In this experiment Intention (implementation intention vs. control intention) served as a between-subjects factor and Distractor (critical distractors, neutral distractors) as a within-subjects factor. Eighteen female and 19 male undergraduate students of the Friedrich-Schiller-University Jena with a mean age of 22 years (Range 18-34) took part in exchange for 5 €. Three

participants had to be excluded from the analysis, because they did not follow the instructions. In an open-ended question in the final questionnaire they indicated that they formed additional implementation intentions related to the phonetic information of the words for the letter detection task.

Procedure

The procedure followed the one of Study 2 except for the following alterations: There was no categorization task at the beginning, but the participants were immediately informed about the letter detection task and started with the “training” that served to manipulate the Intention (see below). The flanker task immediately following the manipulation used two single letters (instead of two words) as stimuli. The letters were placed vertically in the center of the screen and were presented with double spacing between them. Target letters were written in italics, distractor letters in non-italics. Participants had to indicate whether the target letter was a vowel (*a, e, i, u*) by pressing the left control key or a consonant (*d, k, m, s*) by pressing the right control key. The situational cue from the implementation intention (i.e., the letter *d*) served as critical distractor and a set of other consonant letters as control distractors (*k, m, s*). In addition, vowels (*a, e, i, u*) were presented as distractors to support the plausibility of the cover story. Overall, the flanker task consisted of 64 trials plus 10 practice trials. Targets as well as distractors consisted of 32 vowels and 32 consonants. The consonants used as distractors contained 8 critical *d* consonants and 24 neutral consonants. Including the target type as a factor in the analyses reported below did not lead to any significant effects involving this factor or to any changes in the reported results. Therefore, target type was not included in analyses reported below.

After the flanker task, participants worked on a letter detection task, which was included to measure improved performance effects of implementation intentions. The materials were taken from Müsseler, Koriath, and

Nißein (2000). The letter detection task consisted of twelve sentences (see Appendix) that were printed on a standard paper-size sheet in portrait format in 12 pt Times New Roman. Participants had 80 seconds to work through these sentences and to mark all *d* letters. The sentences contained 39 *ds* in function words as well as other words. The letter detection task followed the flanker task to ensure that the goal for the letter detection task was uncompleted during the measurement of the attention attraction effect in the flanker task. Finally, participants filled in a short questionnaire, were thoroughly debriefed, paid and thanked.

Manipulation

The Intention manipulation was labeled as training for the letter detection task. First, participants in both conditions formed the goal to mark all *D/d* letters in the letter detection task. Next, they had to memorize and to write down intentions that were introduced as a useful method to improve their performance in the upcoming letter detection task. In the experimental condition, participants memorized an implementation intention ("If I see a letter *D/d* I will mark it."). In the control intention condition, the intention for the letter detection task was just a replication of the goal, as it was mentioned in the task instructions ("I will mark all letter *D/ds*.").

Measures

Flanker task: Two indices were calculated for the analysis of the flanker task: the mean response time on trials with neutral distractors (*k*, *m*, *s*) and the mean response time on trials with the critical distractor (*d*). For the analysis of the relation between the attention attraction effect and the improved performance effect of implementation intentions, an attention attraction score was computed by subtracting the mean response time on trials with neutral distractors from the mean response time on trials with critical distractors.

Performance: The absolute number of marked *ds* in the letter detection task was used as a measure of performance. Overall 39 *ds* had to be marked, including 6 that were difficult to detect in specific function words (i.e., in German *der*, *die*, and *das*).

Questionnaire: The items of the final questionnaire assessed the perceived attentional attraction ["Did you have distracting thoughts that hindered you during the processing of the vowel or consonant task?", 1 (*very few distracting thoughts*) to 9 (*many distracting thoughts*)], the perceived impact of the intentions on the performance ["Did the training improve your performance in the vowel or consonant task?", 1 (*not at all*) to 7 (*very much*); "How do you rate your performance with regard to marking all *ds* in the letter detection task?", 1 (*many d overlooked*) to 7 (*no d overlooked*)] as well as control questions ["How difficult were the tasks for you?", 1 (*difficult*) to 7 (*easy*)].

4.4.2 Results

Flanker Task

For the analysis of the flanker task all responses that were given faster than 150 ms and 2 standard deviations slower than the mean response time (> 1888 ms) as well as wrong answers were omitted from the calculation (overall 8.92 percent of the trials). Error rates in the flanker task did not differ between conditions, $F(1, 32) = 0.77$, $p = .387$, $\eta^2_p = .023$.

As in Study 2, a mixed MANCOVA was calculated with Intention (implementation intention vs. control intention) as between-subjects factor, Distractor (critical distractor, neutral distractor) as within-subjects factor and the

mean reaction time of the residual trials that were not included in the critical comparison (i.e., vowel distractors) as covariate⁶.

Table 3: Mean estimates (standard deviation) of response times from the flanker task as a function of Intention and Distractor (Study 3, N = 34).

	Implementation intention condition	Control intention condition
Flanker task		
Critical distractor (<i>d</i>)	969.41 (73.65) ^a	896.27 (78.28) ^b
Neutral distractors	973.84 (48.16)	993.64 (51.20)

Note: Within rows, means having different superscripts^{a b} differ significantly at a level of $p < .05$.

In line with our hypothesis, the Intention x Distractor interaction was found, $F(1, 31) = 11.38$, $p = .002$, $\eta^2_p = .269$ (see Table 3). Pairwise comparisons revealed that reaction times to target cues appearing simultaneously with critical distractors were longer in the implementation intention ($M = 969.41$ ms, $SD = 73.65$) than in the control intention condition ($M = 896.27$ ms, $SD = 78.28$), $F(1, 31) = 8.03$, $p = .008$, $\eta^2_p = .206$. No differences in reactions between the implementation intention ($M = 973.84$ ms, $SD = 48.16$) and the control intention condition ($M = 993.64$ ms, $SD = 51.20$) were found when target cues simultaneously appeared with neutral distractors, $F(1, 31) = 1.22$, $p = .277$, $\eta^2_p = .038$.

⁶ There was a main effect of the covariate, $F(1, 31) = 519.25$, $p < .001$, $\eta^2_p = .944$. No interaction between this covariate and distractor, $F(1, 31) = 1.24$, $p = .273$, $\eta^2_p = .039$, and no main effect of condition emerged, $F(1, 31) = 2.34$, $p = .136$, $\eta^2_p = .070$.

Letter-detection task

For the letter detection task the predicted effect of Intention was found, $F(1, 32) = 5.47$, $p = .026$, $\eta^2_p = .146$. Participants in the implementation intention condition ($M = 29.06$, $SD = 3.31$) marked significantly more *ds* compared to participants in the control intention condition ($M = 26.00$, $SD = 4.19$).

Table 4: Mean number (standard deviation) of marked ds from the letter detection task as a function of Intention (Study 3, $N = 34$).

	Implementation intention condition	Control intention condition
Letter detection task (numbers of <i>d</i> letters marked)	29.06 (4.19) ^a	26.00 (3.31) ^b

Note: Within rows, means having different superscripts^{a b} differ significantly at a level of $p < .05$.

Importantly, these differences were also maintained for 6 difficult detectable *ds* included in the task. Participants in the implementation intention condition ($M = 3.61$, $SD = 2.18$) marked more difficult detectable *ds* compared to the control intention condition ($M = 2.5$, $SD = 2.31$), $F(1, 31) = 4.17$, $p = .049$, $\eta^2_p = .115$.

In line with our hypothesis, a positive relation between attention attraction effect and the performance was found, $r = .37$, $N = 34$, $p = .028$. The more attention the *ds* attracted in the flanker task the better was the performance in the letter detection task.

To test whether the impact of the implementation intention on the performance resulted from the attention attracted by situational cues, a

mediation analysis following the procedural suggestions of Baron and Kenny (1986) was computed. As reported above the Intention effected the attention attraction score ($\beta = .49, p = .003$). The significant impact of the Intention on the performance reported above ($\beta = .38, p = .026$) dropped below the conventional level of statistical significance ($\beta = .26, p = .169$) when the attention attraction score ($\beta = .25, p = .185$) was entered as second predictor into a multiple regression. Even though, the decline in the effect of the Intention after controlling for the attention attraction points to an indirect effect of the Intention on the performance via the attraction, this effect was not significant (Sobel $t(32) = 1.29, p = .207$). When performance is entered as second predictor ($\beta = .22, p = .185$) in the regression of the attention attraction score on the Intention, the effect of the attention remains significant ($\beta = .40, p = .003$). Hence, there is also not evidence for an indirect effect of the Intention on the attention attraction via the performance (Sobel $t(32) < 1$).

Questionnaire

Participants did not experience a different amount of distraction in the flanker task ($M_{ij} = 2.44, SD_{ij} = 0.92, M_{ci} = 3.06, SD_{ci} = 1.77$), $F = 1.69, p = .203, \eta^2_p = .050$. The intentions were perceived as slightly more useful in the implementation intention condition ($M = 4.89, SD = 0.96$) compared to the control intention condition ($M = 4.07, SD = 1.53$), $F(1, 32) = 3.52, p = .070, \eta^2_p = .102$. In addition, the perceived performance in the letter detection task was rated as higher in the implementation intention condition ($M = 4.94, SD = 1.06$) compared to the control intention condition ($M = 3.93, SD = 1.48$), $F(1, 32) = 5.30, p = .028, \eta^2_p = .142$. The tasks were rated as equally difficult in both condition ($M_{ij} = 5.00, SD_{ij} = 1.63; M_{ci} = 5.11, SD_{ci} = 1.64$), $F(1, 32) = 0.39, p = .845, \eta^2_p = .001$.

4.4.3 Discussion

Replicating the findings of Study 2, Study 3 also found the attention attraction effects of situational cues from implementation intentions during the pursuit of a goal that the implementation intentions were not formed for. In line with our hypothesis, participants slowed down in the flanker task when situational cues from implementation intentions appeared as distractors compared to participants that did not form an implementation intention. No differences in reaction times were found between Intention conditions, if target cues were presented with a neutral distractor.

For the letter detection task, better performance was found in the implementation intention compared to the control intention condition. Participants in the implementation intention condition marked more *ds* overall as well as more difficult detectable *ds* than participants in the control intention condition. These results replicate the findings of Webb and Sheeran (2004). Furthermore, the expected positive correlation between the attention attraction effects and the improved performance effects of implementation intentions was found. The more intentions attracted attention in the unrelated flanker task, the better the performance in the letter-detection task. The questionnaire indicated that participants recognized the beneficial effects of the implementation intention for the letter detection task but not the disruptive effects in the flanker task. This again replicates the findings from Studies 1 and 2.

4.5 Discussion attentional side effects of implementation intentions

The aim of the present research was to examine attentional effects of implementation intentions. More precisely, it was predicted that implementation intentions lead to attention attraction effects for situational cues included in them, above and beyond goals (Moskowitz, 2002) and that these effects are

related to improved performance effects of implementation intentions. Overall, the results of the present studies confirmed these predictions. In Study 1, attention attraction effects for situational cues were found for participants that formed an implementation intention compared to participants that formed only an intention to act. The performance on one subgoal (marking critical *ps*) that is highly dependent on attention was diminished by forming an implementation intention for a second subgoal (marking critical *ds*) that was simultaneously pursued.

Studies 2 and 3 provided even clearer evidence that situational cues from implementation intentions attract attention (a) by measuring attention more directly using a flanker task and (b) by assessing the attention attraction effect during the pursuit of another goal that is unrelated to the goal the implementation intention was formed for. Attention attraction effects of implementation intentions were found for cues included in an implementation intention but not for cues that were part of a control intention.

The current findings extend those of Steller (1992, cited in Gollwitzer, 1993) because in their studies participants in the control condition did not hold a goal whereas in our studies all participants had formed the goal, the implementation intention was based on. Goals have been shown to attract attention (Moskowitz, 2002). Thus, the differences between conditions in the studies of Steller (1992, cited in Gollwitzer, 1993) could be attributed to goals. However, in our studies all participants formed a goal and even an intention to act. Hence, the current experiments clearly demonstrate that implementation intentions lead to attention attraction effects for situational cues specified in them, supporting the assumption of Gollwitzer and Schaal (1998). Study 3 also provided evidence for the second aim of the present research. A positive relation between attention attraction effects and performance has been demonstrated. The more attention a situational cue attracts, the better

performance is during goal pursuit. Even though there was only weak evidence for this in the current study, one might speculate that the attention attraction effects from implementation intentions lead to an increase in performance, because when situational cues attract attention this lowers the risk that good opportunities to act are missed. Further research might seek more evidence for this process assumed by Gollwitzer and Schaal (1998).

Due to the automaticity of the attention attraction effects they are very hard to control. Therefore, the attraction of attention through implementation intentions could lead to costs, because other important cues are prevented from getting enough attention and the pursuit of competing important goals suffers. The current research provided initial evidence for this downside of implementation intentions. The subgoal to mark critical *ps* as well as the response speed in the flanker task during distractor trials suffered from the implementation intention. Therefore, care should be taken to form implementation intentions that include situational cues occurring in other contexts than in the one where the goal furnished with the implementation intentions is meant to be pursued. Otherwise the attainment of other goals might suffer. Taking into account that implementation intentions are always bound to self set goals that can be actualized and that the formation of implementation intentions needs a conscious mental act (Gollwitzer, 1999), inadequate attentional attraction effects should not outweigh the benefits of implementation intention for goal pursuit.

As an example for the intended as well as unintended implementation intention effects, one could intend to call back one's grandma. To improve the attainment of this goal an implementation intention 'If I see a telephone, I will call back my grandma.' can be formed. This is a simple act that can be done even shortly before an important business meeting. But it could be that during the meeting, one will find oneself glimpsing at a telephone behind the

conversation partner, even if one tries to hold eye contact. However, once the meeting is over, the implementation intention will ensure that the telephone will not escape one's attention and the grandma will be called.

5 IMPLEMENTATION INTENTIONS AND BEHAVIORAL SIDE EFFECTS

Whereas the first three studies examined side effects of implementation intentions in form of attention attraction effects, Study 4 and 5 investigated if implementation intentions lead to unintended behaviors. More precisely, the consequences of implementation intentions for evaluative behaviors in social contexts were examined. Social judgments have been chosen as an application area of implementation intentions because most often judgments of a group are not made in complete isolation, but against the interpretative background of other groups (Tajfel, 1981, Tajfel & Turner, 1986). Judgments of one group have been found to be interrelated to the judgments of other groups. Interferences of such interrelations between social groups can disturb social relations between groups and even lead to harmful social conflicts. Therefore, it is of high importance to examine the potential consequences of volitional strategies on behavior in social contexts. In the following, I will focus on consequences of implementation intentions in contexts with more than one social group. It will be argued that the specification of behavior directed at one specific social group within an implementation intention impacts on behavior directed at different social groups. Depending on the relation between the respective groups, discrete patterns of the implementation intention impact on the behavior directed at a different group are expected. The automaticity of the implementation intention effects is discussed as the mechanism underlying the predicted impact of implementation intention on judgments of social groups.

5.1 The automaticity of implementation intentions

Gollwitzer and Schaal (1998, p. 124) assume that implementation intentions operate as a “strategic automaticity when a conscious act of will

delegates the control of one's actions to anticipated inner or external events." In other words: by forming an implementation intention a link between the specified situation and the goal-directed behavior is established. Based on this link the goal-directed behavior is automatically initiated when the critical situation is encountered. "This automaticity should be rooted in particularly effective memory retrieval processes in situ as a result of having mentally linked selected suitable situations and effective goal-directed behaviors ahead of time" (Gollwitzer, 1999, p. 495). Evidence supports the assumption that implementation intentions lead to automatic action initiation (Bayer, Moskowitz, & Gollwitzer, 2002, cited in Gollwitzer et al., 2005; Brandstätter et al., 2001; Webb & Sheeran, 2004).

Even though this automaticity has without any doubt advantages for the pursuit of goals, it might also, as most other automatic effects, have disadvantages: just as heuristics most of the time are functional but in some cases lead to errors (Kahneman, Slovic, & Tversky, 1982) and stereotypes are sometimes useful (Macrae, Milne, & Bodenhausen, 1994) but they also lead to unjustified prejudice (Devine, 1989), implementation intentions might lead to the automatic initiation of the specified behavior in a moment, when it does not lead to goal attainment but has unintended effects. Such overgeneralization will be studied in the current article in the field of judgments of social groups.

5.2 Generalization effects of the automaticity of implementation intentions

Overgeneralization of implementation intentions is defined as the automatic initiation of behavior specified in implementation intentions by situational cues of implementation intentions, when this behavior cannot serve the goal the implementation intention was formed for. Given that the behavior specified in the implementation intention is applicable in the pursuit of another

goal, the resulting behavior should be biased in the direction of the behavior specified in the implementation intention as overgeneralization (e.g., modifying the judgment of one target while the implementation intention was formed for another target).

Why should such effects occur? Numerous studies on automatic behavior demonstrated that priming a cue leads unintentionally to associated behavior (e.g., Bargh, Chen, & Burrows, 1996; Chen & Bargh, 1997; Dijksterhuis & van Knippenberg, 1998; for a review, see Dijksterhuis & Bargh, 2001). If implementation intentions indeed operate based on automaticity, similar effects should result from the cues specified in the implementation intention. When these situational cues are present the behavior associated to them via an implementation intention will occur, no matter whether the goal underlying the implementation intention can be pursued or not.

Research on automatic behavior did not only demonstrate that cues can elicit concordant behavior but also, under certain conditions, priming a cue may lead to contrast effects (e.g., Dijksterhuis et al., 1998; Dijksterhuis, Spears, & Lépinasse, 2001; Schubert & Häfner, 2003; Spears, Gordijn, Dijksterhuis, & Stapel, 2004). That is, if a social comparison between the self and the prime was unconsciously provoked, people unintentionally acted opposite to what a situational cue suggested. Social comparisons can be provoked by priming single exemplars or a stereotype. For example, categorizing perceived others (e.g., elderly) as part of the vis à vis outgroup or subliminally priming the self during the activation of a stereotype, the self does not belong to (e.g., hussy), does both lead to automatic behavioral contrast from the stereotype (faster instead of slower reactions in a lexical decision task after priming the elderly; more instead of less correct answers in a knowledge task after priming hussy, Schubert & Häfner, 2003).

Based on these findings, it was predicted not overgeneralization but automatic contrast effects from implementation intentions, when situational cues of an implementation intention are present and at the same time social comparisons take place. As a consequence, the behavior should be endorsed in the opposite direction of the behavior included in the implementation intention. This is, for example, the case when a cue from an ingroup-related implementation intention occurs, while the behavior is directed towards an outgroup.

Taken together, side effects of implementation intentions in form of automatic overgeneralization (i.e., behavior as specified in the implementation intention) are expected when implementation intention cues are presented during the pursuit of another goal and no social comparison is provoked. Contrast effects (i.e., opposite behavior as specified in the implementation intention) are expected when the respective cues are present and a social comparison is provoked at the same time. More specifically, it was predicted that forming an implementation intention to positively judge a group will also improve the judgment of a group not included in this intention when the situational cue included in the implementation intention is present during the judgment of the other group. This effect will only occur when both groups are outgroups (i.e., no social comparison will be provoked). Furthermore, it was predicted that an implementation intention to judge an ingroup positively leads to contrast effects in the judgment of an outgroup (i.e., more negative judgment) in the presence of ingroup cues, because social comparisons will take place. Beside both overgeneralization effects, it was predicted that the groups the implementation intentions have been formed for are more positively judged.

Overview of the studies on behavioral side effects of implementation intentions

The present research examined whether group-directed implementation intentions beside an improved attainment of their respective goal led to side

effects in the form of automatic behavioral overgeneralization and contrast effects. To measure these effects, cues from group-directed implementation intentions were present during the judgment of different groups. Implementation intentions related to group judgments were expected to not only lead to the intended endorsed group judgments but in addition to unintentionally biased outgroup judgments if cues of the implementation intention are present.

To test these predictions two experiments were conducted in which intentions were varied between participants. Participants furnished a goal intention either with an implementation intention or a control intention. In Study 1, the participant's goal was to judge a specific outgroup positively, that was treated unfairly in the judgment task, whereas in Study 2 it was their goal to improve ingroup judgments. Study 1 was conducted to examine the overgeneralization from implementation intention effects from judgments of one outgroup to judgments of a different outgroup. In Study 2 it was tested, if the inclusion of the social self in the implementation intention led to contrasting overgeneralization effects from the judgment of the ingroup to the judgment of an outgroup.

5.3 Study 4

In Study 4, participants were categorized as members of a social group. Their task was to judge the quality of ideas generated by two outgroups. Intentions to support one of the two groups were formed, because this group was treated unfairly by earlier judges. Participants furnished a goal intention either with an implementation intention or a control intention. The judgments had to be made in the presence of cues that indicated the group whose ideas had to be judged subsequently. By varying these cues, the judgment of one outgroup had in some cases to be made in the presence of the other. This

design served to measure the overgeneralization of implementation intention effects to the judgment of an implementation intention unrelated group.

For the judgment of the ideas of the outgroup that was included in the implementation intention, more favorable judgments in the implementation intention condition compared to the control intention condition were predicted no matter which group had to be judged next. For the judgment of the ideas of the outgroup that was *not* included in the implementation intention, more favorable judgments in the implementation intention condition compared to the control intention condition were predicted if the situational cue of the implementation intention (i.e., the group the implementation intention was formed for) was present in the background. No differences were expected between conditions if cues of the implementation intention unrelated outgroup were present in the background of the implementation intention unrelated outgroup judgment.

5.3.1 Method

Design and Participants

Study 4 had a mixed 2 x 2 x 2 design with Intention (implementation intention vs. control intention) as a between-subjects factor and Group (red / intention outgroup vs. blue / control outgroup) and Background (same group present in the background vs. other group present in the background) as within-subjects factors. Thirty-seven female and 23 male undergraduate students of the Friedrich-Schiller-University Jena with a mean age of 22 years (Range 18-28) took part in the experiment in the exchange for 5 €.

Procedure

On average, six participants (range: 3-8) attended per session at separate computers. They were told that they would work on a computer-based

Study on marketing techniques. First, they were ostensibly randomly assigned to one of six different teams to introduce a social categorization. All participants were assigned to the green team. Then, they were requested to generate new names for products. It was stated that *each* of the teams will get an additional 100€ if their product names were judged more positive than a given criterion to increase motivation and also to ensure that no negative interdependence between groups was perceived. After the generation of product names as part of the cover story, participants were told that they would have to judge product names members of the different teams generated earlier. In a second random assignment procedure it was ostensibly determined, which teams had to be judged. In fact, all participants had to judge the red and the blue team. Participants worked on a training for this task before the task started, which was in fact the intention manipulation.

To motivate the so-called training they were shown a bogus overview of the previous judgments of the six teams. The red team got the worst judgment by co-participants but not by experts and the blue team was almost equally judged by both groups. It was stated that the judgment of the product names of the red team was unfair and that the upcoming training aimed to correct this bias by training swift and fair judgments. Thus, participants in both conditions formed goal intentions to judge product names depending on their fit to actual products and to judge the ideas fairly. Next, depending on the experimental condition an *implementation intention* (“If I judge product names of the *red team*, I choose the highest adequate amount of points”) or a *control intention* (“I choose the highest adequate amount of points for the *red team*”) was formed in for the judgment of the red team but not for the judgment of the blue team. Participants read the intention, rehearsed it three times and wrote it down on the next page of the manipulation sheet. Besides these different intentions, both experimental conditions were completely identical.

Next, participants judged the quality of different names for the same products they generated names for before. These names had seemingly generated by the members of the red and the blue team. The product names consisted of two sets of names that were randomly assigned to the two teams. After completing the product name judgment, participants worked through a final questionnaire, were debriefed and thanked.

Measures

Judgments: Participants judged product names from the red team (OG_{red}) and from the blue team (OG_{blue}) on a 13-point scale. Higher numbers indicated better judgments. The factor *background* was varied within the judgment task. The group membership of the persons, whose product names had to be judged, was indicated by the text and by the color of the frame around the judgment scale and the window. In the background of the actual judgment, participants partly saw the window of the next judgment task (similar to the cascade function in most operation systems and software). Participants were told that the team of the following judgment is present in the background of the actual judgment as additional information for their convenience. Thus, cues of two groups were present on the screen during the judgment: the one the current idea stems from and the one the following idea stems from. By this feature the factor background was operationalized. For each judgment participants had 30 seconds. Number of missing answers in the critical 24 judgments ($M_{implementation\ intention\ (ii)} = 0.10$, $SD_{ij} = 0.55$; $M_{control\ intention\ (ci)} = 0.10$, $SD_{ci} = 0.40$, overall 0.42 percent) and reaction times ($M_{ij} = 5.70$ s, $SD_{ij} = 1.04$; $M_{ci} = 5.54$ s, $SD_{ci} = 1.30$) did not differ between conditions, $F < 1$. These figures indicate that participants in both conditions had no problem to make their judgment in the given time. The first judgment served as a practice trial, the last judgment consisted of only one group, without a second group in the background, to fit the cover story. These two judgments were not included in

the analysis. The mean number of points was computed separately for the two groups and the two backgrounds, resulting in four group-background combinations ($OG_{red} - OG_{red}$, $OG_{red} - OG_{blue}$, $OG_{blue} - OG_{blue}$, $OG_{blue} - OG_{red}$). Each of these combinations contained 6 trials.

Questionnaire: In the final questionnaire participant's identification with the green team was measured on a three-item scale ("I identify with my team", "I am glad to belong to the green team", "I see myself as an important member of the green team", $\alpha = .84$). In addition, the questionnaire included separate control items related to the manipulation ("How helpful was the intention for the judgment of the created product names?", "Did the intention lead you to pay less attention to the product names of the other team?"), to the perceived performance in the product generation task ("The product names I created were of high quality") and to the strategy used ("I tried to treat both teams as equal as possible"). All items responded to on 7-point scales.

5.3.2 Results

The judgments of the group the implementation intention was formed for (OG_{red}) were predicted to be better in the implementation intention condition compared to the control intention condition. Judgments of the implementation intention unrelated outgroup (OG_{blue}) were predicted to be better in the implementation intention condition compared to the control intention condition, only when the cue of the OG_{red} was in the background, but not when the cue of the OG_{blue} was in the background. To test this prediction, a mixed MANOVA was computed with Group and Background as within-subjects factors, Intention as between-subjects factor and judgment of product names as the dependent variable.

Table 5: Mean distribution task judgments of Intention OG_{red} and OG_{blue} product names (in points) and standard deviations in brackets as a function of Intention and Background (Study 4, N = 60).

	Intention OG _{red} judgment		OG _{blue} judgment	
	Implementation intention	Control intention	Implementation intention	Control intention
Same group in background	7.33 (1.95)	6.31 (1.98)	7.32 (2.19)	6.88 (1.99)
Other group in background	7.94 (1.89)	6.48 (2.01)	7.23 (1.88)	6.26 (1.34)

A main effect of background, $F(1, 58) = 4.85, p = .032, \eta^2_p = .077$, a main effect of intention, $F(1, 58) = 5.40, p = .024, \eta^2_p = .085$, and a trend towards an Intention x Group interaction was found, $F(1, 58) = 2.54, p = .116, \eta^2_p = .042$. These effects were qualified by the expected Intention x Group x Background interaction, $F(1, 58) = 4.53, p = .038, \eta^2_p = .072$. All other F s < 0.29, all p s > .59, all η^2_p s < .005.

To further explore the 3-way interaction simple comparisons based on the intention manipulation were computed. Product names of the OG_{red} were as predicted judged more favorable in the implementation intention condition ($M = 7.64, SD = 1.81$) than those in the control intention condition ($M = 6.39, SD = 1.79$), $F(1, 58) = 7.14, p = .010, \eta^2_p = .110$. Simple comparisons were significant no matter which group was in the background, both F s > 4.1, both p s < .05. For the implementation intention unrelated OG_{blue}, no effect of intention was found in the same background condition, ($M_{ij} = 7.32, SD_{ij} = 2.19; M_{ci} = 6.88, SD_{ci} = 1.99$), $F(1, 58) = 0.64, p = .426, \eta^2_p = .011$. However, product

names of the OG_{blue} with a cue of OG_{red} in the background were judged more positively in the implementation intention condition ($M = 7.23$, $SD = 1.88$) than in the control intention condition ($M = 6.26$, $SD = 1.34$), $F(1, 58) = 5.32$, $p = .025$, $\eta^2_p = .084$. In sum, the results are fully in line with our predictions.

Questionnaire

In both conditions, participants identified with their green team to the same extent ($M_{ij} = 4.09$, $SD_{ij} = 1.34$; $M_{ci} = 4.21$, $SD_{ci} = 2.15$), $F(1, 58) = 0.07$, $p = .792$, $\eta^2_p = .001$. The judgments of the self generated product names ($M_{ij} = 3.77$, $SD_{ij} = 1.22$; $M_{ci} = 3.53$, $SD_{ci} = 1.43$) as well as all remaining items did not differ between conditions, all $F_s < 0.17$, $p_s > .697$, $\eta^2_p < .003$. The intentions were perceived as equally helpful in both conditions ($M_{ij} = 3.23$, $SD_{ij} = 1.63$; $M_{ci} = 3.13$, $SD_{ci} = 1.81$), and did not influence the perceived attention that was paid to product names of the other team, ($M_{ij} = 2.20$, $SD_{ij} = 1.54$; $M_{ci} = 2.17$, $SD_{ci} = 1.51$). Most important, the conditions did not differ in the intended strategy to treat both teams as equal as possible, ($M_{ij} = 4.60$, $SD_{ij} = 2.16$; $M_{ci} = 4.83$, $SD_{ci} = 2.18$). Thus, the implementation intentions did not affect strategies, identification or the perceived impact of implementation intentions, even though they lead to a change in behavior. This suggests that the effects of implementation intentions operate below consciousness.

5.3.3 Discussion

Study 4 provides evidence for overgeneralization effects of implementation intentions. If situational cues from an outgroup-directed implementation intention were present during the judgment of another outgroup, they led to more favorable judgments. In addition to these overgeneralization effects of implementation intentions, the predicted improved performance was found in the form of more favorable judgments of the implementation intention related outgroup. The implementation intention related outgroup was judged

more favorable in the implementation intention condition compared to a control intention condition. No differences between conditions were observed concerning the identification, the perceived performance in the product generation task and the chosen strategy to treat both teams as equally as possible as indicated in the final questionnaire. Thus, implementation intentions overgeneralized to other goal pursuits (i.e., led to differential treatment) despite people's explicitly assessed strategy was to treat both groups equally.

5.4 Study 5

To extend the evidence for the overgeneralization effects from Study 4, automatic behavioral contrast effects from implementation intentions should be shown. An implementation intention for the treatment of the ingroup should lead to automatic contrast in behavior towards a relevant outgroup in the presence of implementation intention cues.

In Study 5, participants formed an implementation intention for the judgment of the ingroup. Accordingly, in the judgment task they had to judge their ingroup and an outgroup. Besides these changes, Study 5 was replicating Study 4. More favorable judgments of the ingroup in the implementation intention condition compared to the control intention condition were predicted. For the ideas of the outgroup that were not included in the implementation intention, *less* favorable judgments (i.e., the contrast effect) in the implementation intention condition compared to the control intention condition were predicted if ingroup cues were present in the background, but not if cues of the outgroup were present in the background.

5.4.1 Method

Design and Participants

A mixed 2 x 2 x 2 design with Intention (implementation intention vs. control intention) as between-subjects factor and Group (ingroup red vs. outgroup blue) and Background (same group present in background vs. other group present in background) as within-subjects factors was used. Thirty-nine female and 28 male undergraduate students of the Friedrich-Schiller-University Jena with a mean age of 21 years (Range 18-32) took part in the experiment in the exchange for 5 €.

Procedure

The procedure was identical to the one of Study 1 apart from the following alterations: Participants were assigned to the red team (instead of the green team). They formed an implementation intention for the judgment of the red team and judged product names of the red and one ostensibly randomly assigned other team (blue team). Hence the ingroup was included in the intentions and judgments.

Manipulation

As in Study 1, the intention manipulation was introduced as a training for the product name judgment task. Instead of an implementation intention to support an outgroup that was treated unfairly, they formed an implementation intention for their ingroup (i.e., red team). Because of the self-interest, no justification was necessary. In the implementation intention condition participants furnished the goal intention to judge product names with the *implementation intention* "If I judge product names of my team, I choose the highest adequate amount of points", whereas in the control intention condition

they furnished it with an analogous *control intention* “I choose the highest adequate amount of points for my team.”

Measures

Group judgments: The dependent measure was identical to the one used in Study 4. The two within-subjects factors were realized by ingroup vs. outgroup judgments and same vs. other team in the background ($IG_{red} - IG_{red}$, $IG_{red} - OG_{blue}$, $OG_{blue} - OG_{blue}$, $OG_{blue} - IG_{red}$). Neither the number of missing answers, ($M_{ij} = 0.34$, $SD_{ij} = 1.95$; $M_{ci} = 0.06$, $SD_{ci} = 0.24$), $F(1, 65) = 0.75$, $p = .390$, $\eta^2_p = .011$, overall 0.84 percent), nor reaction times ($M_{ij} = 5.50$ s, $SD_{ij} = 1.41$; $M_{ci} = 5.55$ s, $SD_{ci} = 1.21$), differed between intention conditions, $F(1, 65) < 1$, indicating that participants in both conditions followed the instructions equally well.

Questionnaire: In the final questionnaire, participant’s identification with their team was measured on the three-item scale of Study 4 ($\alpha = .86$). The remaining items measured the perception of the manipulation, the performance in the product generation task, and the strategy used.

5.4.2 Results

Ingroup judgments were expected to be more favorable in the implementation intention than in the control intention condition independent of the background. Outgroup judgments were predicted to be less favorable in the implementation intention condition compared to a control intention condition when ingroup cues were shown in the background, but not when outgroup cues were shown in the background. To test these predictions, a mixed MANOVA was computed with Group and Background as within-subjects factors, Intention as between-subjects factor and judgment as dependent variable.

Table 6: Mean distribution task judgments of Intention Ingroup and Outgroup product names (in points) and standard deviations in brackets and as a function of Intention and Background (Study 5, N = 67).

	Intention ingroup judgment		Outgroup judgment	
	Implementation intention	Control intention	Implementation intention	Control intention
Same group in background	9.17 (2.64)	8.34 (2.61)	6.04 (2.34)	6.29 (2.35)
Other group in background	9.82 (2.71)	8.36 (2.48)	5.48 (2.23)	6.58 (2.23)

A strong preference for ingroup ideas ($M = 8.94$, $SD = 2.47$) over outgroup ideas ($M = 6.08$, $SD = 2.11$) was found, $F(1, 65) = 47.06$, $p < .001$, $\eta^2_p = .420$. This effect was qualified by an Intention by Group interaction, $F(1, 65) = 4.89$, $p = .031$, $\eta^2_p = .070$, that was again qualified by the predicted Intention x Group x Background interaction, $F(1, 65) = 4.86$, $p = .031$, $\eta^2_p = .070$. All other $F_s < 1.98$, $p_s > .164$, $\eta^2_p < .030$.

To explore the three-way interaction further, simple comparisons based on the intention manipulation were computed. As predicted, product names of the ingroup ($M = 9.50$, $SD = 2.68$) were judged more favorably in the implementation intention condition than in the control intention condition ($M = 8.35$, $SD = 2.55$), $F(1, 65) = 3.58$, $p = .063$, $\eta^2_p = .052$. There was no Intention x Background interaction on the judgment of ingroup targets, $F(1, 65) = 2.55$, $p = .116$, $\eta^2_p = .038$.

For the outgroup judgments, an Intention x Background interaction was found, $F(1, 65) = 5.18, p = .026, \eta^2_p = .074$. No differences between intention conditions occurred for same backgrounds ($M_{ij} = 6.04, SD_{ij} = 2.34; M_{ci} = 6.29, SD_{ci} = 2.35$), $F(1, 65) = 0.19, p = .666, \eta^2_p = .003$, whereas for different backgrounds, significant differences in the predicted direction were found between conditions, $F(1, 65) = 4.06, p = .048, \eta^2_p = .059$. Product names of the outgroup with a cue of the ingroup in the background were judged less favorably in the implementation intention condition ($M_{ij} = 5.48, SD_{ij} = 2.23$) than in the control condition ($M_{ci} = 6.58, SD_{ci} = 2.23$).

Questionnaire

Participants in the control intention condition tended to identify more with their red team compared to the implementation intention condition, ($M_{ij} = 3.33, SD_{ij} = 1.50; M_{ci} = 4.04, SD_{ci} = 1.72$), $F(1, 65) = 3.17, p = .080, \eta^2_p = .047$. All other questionnaire measures did not differ between conditions, all other F s < 2.09, p s > .153, η^2_p s < .031 (product name judgment red team: $M_{ij} = 4.56, SD_{ij} = 1.16, M_{ci} = 4.71, SD_{ci} = 1.05$; blue team: $M_{ij} = 4.34, SD_{ij} = 1.21; M_{ci} = 4.17, SD_{ci} = 1.04$; own ideas: $M_{ij} = 3.72, SD_{ij} = 1.35; M_{ci} = 4.09, SD_{ci} = 1.50$; helpfulness of intentions: $M_{ij} = 3.72, SD_{ij} = 1.97; M_{ci} = 3.66, SD_{ci} = 2.01$; attention paid to product names of the other team: $M_{ij} = 3.47, SD_{ij} = 1.88; M_{ci} = 2.83, SD_{ci} = 1.74$). Most important, the conditions did not differ in the reported strategy. In both conditions, participants tried to treat the teams equally, ($M_{ij} = 4.38, SD_{ij} = 2.09; M_{ci} = 4.86, SD_{ci} = 2.07$). Thus, implementation intentions lead participants to different judgments (more ingroup favoritism and outgroup negativity), even though explicit strategies were not affected by the intentions and social identification was even higher in the control intention condition.

5.4.3 Discussion

Study 5 provides evidence for overgeneralization effects of implementation intentions taking the form of behavioral contrast. Beside the more favorable judgments of ingroup ideas in the implementation intention condition, the judgment of outgroup ideas showed a contrasting effect (i.e., less

favorable judgment), only if the situational cues from the ingroup-related implementation intention were present during the judgment. Questionnaire data provided no evidence that participants were aware of the impact of the intentions. Hence, the current data provides additional support for the automatic nature of effects from implementation intentions and the overgeneralization resulting from this.

5.5 Discussion behavioral side effects of implementation intentions

In two studies, the predicted overgeneralization effects of implementation intentions were found. In Study 4 the implementation intention to judge one outgroup positively led to positive judgments of this group and positive judgments of another outgroup, when the cues for the first outgroup were present. In Study 5 the implementation intention to judge the ingroup positively led to positive judgments of the ingroup and negative (i.e., contrasting) judgments of an unrelated outgroup, when cues for the ingroup were present. These findings demonstrate that the automaticity of implementation intentions is not restricted to situations where the goal the implementation intention has been formed for can be pursued. In contrast, the automaticity starts to work as soon as the cue it has been bound to shows up. Furthermore, the present findings suggest that, automaticity from implementation intentions can – just as other automatic behavior – either take the form of assimilation or of contrast effects (Schubert & Häfner, 2003). Overgeneralization effects of implementation intentions were elicited, when no social comparison takes place (Study 4) and contrast effects, when the context provoked social comparisons (Study 5). In addition to these side effects, implementation intentions improved the pursuit of the intended goal replicating earlier findings (for an overview, see Gollwitzer et al., 2005). Implementation intentions directed at social groups, with judgments as specified behaviors

influenced participant's judgments in the direction of the judgments specified in the implementation intention.

For the application of implementation intentions our findings imply that beside the advantages implementation intentions have for goal pursuit, they have under certain circumstances disadvantages. Whenever the cue of an implementation intention can appear in a context, where the intended behavior can be shown but does not contribute to the attainment of the goal the implementation intention has been formed for, behavioral resources are wasted and other behavior might become less efficient. In extreme cases unintended behavior can be shown. For example in our studies participants derogated an outgroup unintentionally.

When can these side effects of implementation intentions be expected? With regard to attributes of the situational cue, the presence of the central part of the situational cue should be sufficient to elicit overgeneralization. In the current studies implementation intentions with cues pointing to the judgment of a group were formed ("If I judge product names of the red team, ..."). As a consequence, the presence of a cue pointing to this group during the judgment of *another* group was sufficient to elicit the behavior implied by the implementation intention. Recent work by Webb and Sheeran (2004) has however shown that implementation intentions discriminate between critical and non-critical cues that are quite similar. The difference between their and our studies is that in their case the non-critical cues did not fulfill all conditions specified in the implementation intention whereas in our case overgeneralization occurred when all cues were present (the judgment and the group) but not in the configuration specified in the implementation intention (the judgment *of* the group). Hence, behavior specified in implementation intentions seems to be automatically initiated only if all critical cues are present but their configuration does not seem to matter. Based on the current findings this

conclusion certainly remains speculative and should thus be tested in further research.

With regard to attributes of the behavior specified in the implementation intention, its applicability to the context in which the situational cue occurs will increase the likelihood of overgeneralization effects. In the present studies the behavioral dimension specified in the implementation intention was perfectly applicable to the group the implementation intention was not formed for. But even in case of no or low applicability, the presence of situational cues during the pursuit of another goal should at least attract attention and distract from the current behavior (Wieber & Sassenberg, 2006).

Finally, the goal intention should matter for overgeneralization effects from implementation intentions. Research on the interplay of goal intentions and implementation intentions (e.g., Sheeran et al., 2005) demonstrated that implementation intention effects only occur when the associated *goal is actively held*. Accordingly, overgeneralization is only expected if this condition is fulfilled. However, the pursuit of most real life goals that are equipped with implementation intentions persists over a longer time period (e.g., exercising regularly, taking medication). Consequently, this precondition for overgeneralization effects should be fulfilled rather often, even when people actually pursue another goal.

Taken together, the automatic initiation of behavior through a situational cue of an implementation intention even when it does not help the pursuit of the associated goal is expected if (a) the situational cues are present (not matter in which configuration), (b) the behavior specified in the implementation intention is applicable and (c) the associated goal is actively held.

The present research demonstrated that the automatic initiation of behavior by implementation intentions can be modeled by different environmental contexts. Depending on the social categorization (e.g., ingroup or outgroup), social comparisons take place and the implementation intention behavior overgeneralizes to a different group in form of an endorsement in the direction of the implementation intention or the opposite direction (i.e., contrast behavior). In addition, these overgeneralization effects seem to be independent of people's intentional strategies. In both studies of the present research, judgments of an unrelated outgroup were biased by the implementation intention, even though in both conditions people's intentional strategy was to treat all groups equally. This can be interpreted as an additional hint to the automaticity of the implementation intention side effects.

To conclude, even though implementation intentions are formed by an intentional act of will, they can lead to unintentional consequences due to their automaticity. The same processes underlying the improved goal attainment through implementation intentions can under certain circumstances lead to disadvantages, e.g., the automatic initiation of behavior in a moment, when it is inadequate. These side effects of implementation intentions can take place in form of overgeneralization and contrast effects and are expected to occur despite different intentional strategies.

6 GENERAL DISCUSSION

6.1 Overview of the presented studies

Two main research questions were investigated by the present work: Whereas the first question aimed to inspect *attentional* side effects of implementation intentions, the second question focused on *behavioral* side effects of implementation intentions.

The first research question was addressed in three studies that provide clear evidence that situational cues from implementation intentions attract people's attention even during the pursuit of other goals. In Study 1, attention attraction effects of implementation intentions above and beyond those of goal intentions were demonstrated in an attention-concentration task. Whereas the implementation intention was directed at one subgoal of this task, the predicted diminished performance through the attraction of attention was found concerning a different subgoal that was pursued simultaneously. In Study 2 and 3 attentional effects of implementation intentions were assessed in a separate task to avoid the direct competition of the two subgoals. As predicted, implementation intention cues attracted attention when their situational cues were present even during the pursuit of another goal.

To measure the attention attraction through implementation intentions, different paradigms have been adapted: D2 task in Study 1 (Brickenkamp, 1978), flanker task in Study 2 and 3 (Eriksen & Eriksen, 1974). Despite changes with regard to the cues and decisions that had to be made (words and non-words vs. vowels and consonants) Study 2 and 3 found the predicted attentional side effects of implementation intentions. Thus, the present findings demonstrate the attraction of attention through implementation intentions in

different paradigms as well as with different materials and thereby point to the stability and robustness of these effects.

Although all three studies on attention attraction effects used full attention paradigms (i.e., paradigms where participants had to focus their attention only on one task at a time) and not divided attention paradigms (i.e., paradigms where participants have to divide their attention between more than one task; e.g., Naveh-Benjamin, Craik, Perretta, & Tonev, 2000), the demonstrated side effects of implementation intentions in full attention paradigms should also be valid under conditions of divided attention. As divided attention paradigms demand more of the limited attentional resources than full attention paradigms, it would be expected that in divided attention paradigms yet stronger attraction of attention and thus stronger attentional side effects of implementation intentions occur. Nevertheless, divided attention paradigms provide a suitable method to further investigate attention attraction effects, as they allow examining a potential moderation of the attention attraction effects by modality. For example, visual cues of an implementation intention could have a different impact on the residual attentional capacity for other visual cues than for auditory cues.

Taken together, the present findings fully support the assumption of attentional side effects of implementation intentions. It has been demonstrated that depending on the context (i.e., the goal that is actually pursued) automatic attentional processes can promote goal attainment (i.e., performance improvement) but can also interfere with successful goal pursuit (i.e., attention attraction when it is not helpful for goal attainment). Thereby, the results of the mediation analysis in Study 3 suggest that the impact of the implementation intention on the performance resulted from the attraction of attention through their situational cues. Whereas the performance improvement findings replicate previous research results, the *attention attraction effects* of implementation

intentions (above and beyond goal intentions even during the pursuit of another goal) are the first that provide evidence of attentional side effects and thus costs of the automaticity of implementation intentions in terms of attention.

The second research question was addressed in two studies in the context of social groups. It was examined, if implementation intentions impact on *behavior* even during the pursuit of other goals. Evidence for such automatic behavior effects of implementation intentions have been demonstrated in form of overgeneralization (Study 4) as well as contrast effects (Study 5). In addition, performance improvement through implementation intentions has been shown in both studies. In both studies (Study 4, 5), groups were judged on identical 13-point Likert scales. As predicted, overgeneralization effects of an implementation intention to judge one outgroup positively were found in form of positive judgments of another outgroup, if and *only* if the cues for the implementation intention outgroup were present (Study 4). Moreover, in line with our hypotheses, contrast effects of an implementation intention to judge the ingroup positively were found in form of negative judgments of an unrelated outgroup, *only* if cues for the ingroup were present (Study 5).

Even though in the cover story great effort was spent to ensure that participants do not perceive the groups as interdependent (see section 5.1.1), the present studies do not allow to completely exclude the possibility that the identical rating scales led to the perception of interdependence between the group judgments. If such an interdependence would have been perceived in terms of the ability of an outgroup to influence one's groups outcomes (i.e., high level of *perceived interdependence* between groups), this could have led to improved outgroup judgments as a form of outgroup favoritism (derived from studies on the minimal group paradigm; e.g., Rabbie, Schot, & Visser, 1989). On the other hand, if such an interdependence would have been perceived in form of zero-sum beliefs (i.e., high level of *perceived negative interdependence*

between groups), an accentuation of the group differences would be predicted by theories on intergroup relations (for a summary, see Brewer & Brown, 1998). However, as both intention conditions used the same rating scales, such a perceived interdependence would not explain the behavioral side effects of implementation intentions because the critical behavior *only* occurred when the cue appeared in the background. But to extend the present results, future research could measure performance improvement and automatic overgeneralization of implementation intentions on different dependent measures to avoid any perception of interdependence between the groups. Moreover, the cover story (e.g., different contexts and goals for each group) could be changed. Similarly to findings of studies on automatic behavior (e.g., Bargh et al., 1996; Epley & Gilovich, 1999; Macrae & Johnston, 1998), it would be expected that implementation intentions still lead to side effects in form of overgeneralizing as well as contrasting behavior even when the framing or the scales is changed. Thereby, the applicability of the behavior specified in the implementation intention is assumed to act as boundary condition of these side effects. Only when the specified behavior can still be applied to a different judgment scale, behavioral side effects should occur. To test these assumptions, future research should further explore the role of the perceived interdependence between groups as well as the limits of the applicability of the behaviors, specified in an implementation intention, in different contexts.

Taken together, also the second empirical part of this thesis provides good evidence for side effects of implementation intentions. It has been demonstrated that implementation intentions depending on the context can promote goal attainment (i.e., performance improvement) but, as predicted, can also interfere with successful goal pursuit as a behavioral side effect. Furthermore, these side effects of the automatic initiation of behavior by implementation intentions can be modeled by environmental contexts. Depending on the occurrence of social comparisons, implementation intentions

can lead to overgeneralization or contrast behavior even during the pursuit of another goal. Without social comparisons, *overgeneralization* of implementation intention behavior to the pursuit of another goal was shown. With social comparisons, *contrast behavior* was shown during the pursuit of another goal. Whereas the performance improvement findings replicate previous research results, the demonstrated overgeneralization and contrast behaviors are the first demonstrations of costs of implementation intention in form of behavioral side effects.

These attentional and behavioral side effects of implementation intentions are especially important as the present research provided first evidence that *people are not aware* of them and thus do not consciously regulate their behavior in order to prevent such potential side effects. In the studies on the attentional side effects of implementation intentions, people reported that they perceived no distraction during a decision task, even though their reaction times in fact slowed down when situational cues of an implementation intention were present as distractor. Even more dramatic consequences of such lack of awareness and correction processes of the automatic implementation intention effects have been demonstrated in the second series of studies. Social discrimination in form of unjustified bad judgments of a social group was found even though people's explicitly stated strategy was to treat all groups equally fair. Further support for such a lack of awareness and correction processes was provided by Schaal (1993; cited in Gollwitzer & Schaal, 1998), who's findings suggest that people cannot easily disengage from an ineffective implementation intention during a concentration achievement task. Hence, forming implementation intentions involves the risk of recurring unintended side effects and suboptimal performances because people are not aware of what they are doing and thus cannot consciously correct it.

As a final point, two special features of the manipulation used in the present studies should be pointed out. First, to my knowledge, the present research is the first that included more than one implementation intention in the manipulation. This is especially noteworthy as the number of implementation intentions formed for a goal pursuit can be assumed to moderate their effectiveness. If more implementation intentions are formed for one goal pursuit, the strength of the situation-behavior link as well as the expected accessibility of each of the situational cues and thereby their effectiveness should be reduced. Consequently, attentional and behavioral side effects should be even stronger if only one implementation intention is formed. Moreover, previous findings of performance improvement through implementation intentions can be expected to be weaker if more than one implementation intention would have been formed. Although more research is needed to comprehensively examine the moderation of the implementation intention effects by their number, the present thesis provides good evidence for their effectiveness even when more than one implementation intention is formed for a goal pursuit.

Second, in the present thesis a new type of control condition was employed. Different from the pure familiarization with the situational cues (e.g., Brandstätter et al., 2001) or the formation of irrelevant implementation intentions (e.g., Webb & Sheeran, 2003), *control intentions* were used that avoided different amounts of information between conditions. That is, only the format (i.e., if-then format), but not the arguments (e.g., red team, judge, product name) included an implementation intention differed between conditions. Thereby, the present research is the first that allows excluding different amounts of information between the intention conditions as alternative explanations of the demonstrated implementation intention effects.

6.2 Implications and outlook

6.2.1 Implications for information processing

Implementation intentions promote the pursuit of intended goals (Gollwitzer et al., 2005), but they can also lead to side effects concerning people's attention as well as their behavior. More generally, side effects of implementation intentions, similarly to other processes of self-regulation, are assumed to impact on each of the stages of the information processing sequence. As attentional side effects take place at the beginning of this sequence, all following processes (i.e., encoding, memorizing, modeling, retrieving an information and the resulting decisions, judgments, new representations or behaviors) can also be expected to be influenced by these side effects. For example attentional side effects of implementation intentions could impact on memory. In a study of Chasteen et al. (2001), elderly persons formed an implementation intention to write the day of the week in the upper right corner of every sheet in a performance test. It could be speculated that if these elderly persons would have worked on an additional task that does not demand writing the day of the week in the upper right corner of every sheet (e.g., paper-based memory task), they should have been more likely to be distracted from the actual memory task because their attention would have been attracted by the upper right corner of the sheet. That even such small distractions can actually impede memory has been demonstrated by recent research on prospective memory (e.g., Einstein, McDaniel, Williford, Pagan, & Dismukes, 2003). Thus, it can be expected that the attraction of attention through situational cues of an implementation intention can lead to *forgetting* of other relevant information and thereby seriously impede memory processes and goal attainment as an attentional side effect of implementation intentions.

Moreover, also behavioral side effects of implementation intentions can be assumed to impact on other components of information processing (e.g., other decisions, new representations or behaviors) than on judgments (see Study 4 and 5). Using the example of Chasteen et al. (2001) again, it could be speculated that if the elderly persons would have worked on an additional task that does not demand writing the day of the week in the upper right corner of every sheet (e.g., paper-based concentration task), they should have been more likely to experience interferences initiating a behavior demanded in the additional task. They could even falsely initiate the behavior (i.e., writing down the day of the week) in such an unrelated paper based concentration task because the situational cues lead to the automatic action initiation. Hence, the potential of attentional and behavioral side effects of implementation intentions to bias information processing and thereby seriously impede successful goal attainment points to the importance to further examine the processing of information with respect to such automatic motivational influences.

6.2.2 Implications for intergroup research

In Study 5 of the present thesis, ingroup-directed implementation intentions have been demonstrated to lead to *social discrimination* of an unrelated outgroup as a behavioral side effect. This implies that it is not necessary to be motivated to derogate an outgroup but that volitional strategies directed at the ingroup can result in social discrimination. Thus, implementation intentions (i.e., the automatic initiation of behavior opposite to the one specified in the implementation intention during an outgroup judgment) can lead to a reciprocal relation between ingroup and outgroup-directed behavior. These effects are especially important as in most of the research on social discrimination, variations of ingroup positivity and social identification did not systematically correlate with outgroup negativity (e.g., Kosterman & Feshbach, 1989). Or if such a relation was found (e.g., ingroup bias in the minimal group

paradigm; Tajfel, Billig, Bundy, & Flament, 1971) it has easily been eliminated (i.e., by changing the valence of the allocated resources from positive to negative outcomes; Mummendey et al., 1992) demonstrating that solely categorization processes are not enough to elicit outgroup negativity. Consequently, the necessity to differentiate between ingroup and outgroup attitudes as well as behavior has been pointed out by recent research on prejudice (e.g., the separate treatment of ingroup love and outgroup hate; Brewer, 1999; the separate treatment of ingroup and outgroup attitudes in implicit measures of prejudice; Sassenberg & Wieber, 2005). Although this separate treatment without doubt is useful most of the time, the present findings demonstrate that a reciprocal relation between ingroup and outgroup behavior (e.g., outgroup negativity, Study 5) can be caused by volitional mechanisms linked to the ingroup. Similarly to such automatic effects of volition, it could be expected that also intentional processes could result in a shift from solely ingroup favoritism to outgroup negativity under certain circumstances (e.g., when painful constraints are experienced as ingroup member). More generally, the demonstrated social discrimination, as side effect of an intentional planned volitional strategy (i.e., implementation intentions), points to the importance of further investigating the consequences of automatic as well as intentional volitional processes for intergroup behavior. Thereby, the demonstrated side effects especially call for the examination of the potential of goal striving (i.e., volitional) processes to lead to harmful consequences in the context of intergroup relations (e.g., social discrimination).

Besides costs through behavioral side effects of implementation intentions, also attentional side effects are expected to have costs in intergroup situations. The attraction of attention through (ingroup-related) situational cues of an implementation intention should impair the attention to outgroup-related information and thereby the whole social information processing sequence (see

6.2.1). Thus, although attentional and behavioral side effect of implementation intentions do not necessarily lead to harmful consequences in the context of social groups (e.g., outgroup favoritism as behavioral side effect in Study 4) their automaticity and the lack of control do not allow to exclude the possibility of potential harmful consequences.

6.2.3 Implications for the Rubicon model of action phases

What do these findings imply for the Rubicon model of action phases that served as main theoretical framework for the present thesis? First, the demonstrated impact of implementation intentions on the pursuit of different goals suggests that simultaneously pursued background goals can interfere with successful focal goal achievement. Therefore, it would be useful to extend the Rubicon model of action phases to allow modeling *more than one goal pursuit at a time* (e.g., Fishbach, Shah, & Kruglanski, 2004; Shah, Friedman, & Kruglanski, 2002). Predictions about potential interactions between different goal intentions as well as between implementation intentions and other goal intentions could be derived and potential costs of intentions for the pursuit of other goals could be examined more systematically.

Second, the Rubicon model of action phases should be extended to allow elaborating more on automatic processes, their role during goal pursuit and their interplay with conscious processes during goal pursuit. Such extensions seem especially valuable, as recent theories (e.g., auto-motive theory, Bargh, 1990) and research on unconscious goal pursuit (e.g., Bargh, Gollwitzer, Chai, Barndollar, & Trötschel, 2001) point to the significance of automatic processes for goal pursuit. The present research suggests that it is an useful approach to combine the Rubicon model of action phases with recent theories on motivation (e.g., goal system theory, Kruglanski et al., 2002; auto

motive theory, Bargh, 1990) to allow exploring potential side effects of implementation intentions for the pursuit of other goals (see 6.2.4).

6.2.4 Outlook

Given the severe consequences of side effects of implementation intentions and the seemingly missing ability of people to regulate these effects, it remains an important task for future research to find ways to further examine and to prevent such side effects. With regard to the *formation of implementation intentions*, it could be speculated that *concrete implementation intentions* should at least reduce the likelihood that these cues occur during the pursuit of another goal and thus the likelihood of side effects of implementation intentions. As an additional advantage, such concretely formed implementation intentions should, similarly to concretely formed goal intentions, be more effective than abstract ones (Locke & Latham, 1990). For example, more than one situational cue could be included into the specification of the anticipated situation (e.g., When I turn the *page* in a *psychological test*...). However, as demonstrated in Study 4 and 5 of the present thesis, even the inclusion of more than one situational cue did not prevent behavioral side effects of implementation intentions. The presence of the situational cues (product name, red team) was sufficient to elicit the automatic action initiation, even when a different group (i.e., blue team) had to be judged. Thus, although the presence of both situational cues was necessary for the automatic action initiation (i.e., it did not take place when only one of the two specified situational cues was present: product name, but not red team), the configuration of the situational cues did not seem to matter (see also section 5.3). Hence, specifying more than one situational cue will most likely reduce the likelihood of behavioral side effects of implementation intentions, but as their configuration is not taken into account, they are still possible. Similarly, the concrete formulation of behaviors in an

implementation intention should only reduce the likelihood of behavioral side effects without completely preventing them.

Besides these suggested venues for future research on the formation of plans, the *goal-dependent automaticity* of implementation intentions should be further investigated to get a better understanding of side effects of implementation intentions and ways to prevent them. With regard to the interplay between superordinate goal intentions and implementation intentions, implementation intentions are supposed to lead to the automatic initiation of the specified behavior only when a goal intention is actively held (Sheeran et al. 2005). Up to date, this moderation has only been examined with activated or non-activated goals, but not with *completed goals* or *goals people disengaged from*. Even though it has been argued that the effects of implementation intentions should disappear as soon as the associated goal is completed or a disengagement from the goal took place (Gollwitzer & Schaal, 1998), it has not been systematically examined if implementation intention effects are moderated by these states of the superordinate goal intention. Hence, further research on unintended side effects of implementation intentions is needed to decide, if they still unfold their effects when the superordinate goal intention has been completed or a disengagement from it took place. Potential side effects of implementation intentions could only be prevented when implementation intentions are simultaneously synchronized with their superordinate goal intentions.

Moreover, future research could investigate the *robustness* of the demonstrated side effects by *extending the time period* between the formation of an implementation intention and the measurement of their side effects. In the present research, the superordinate goal of the implementation intention was formed directly before the measurement of their side effects and the

performance improvement. Thus, it could be assumed that the demonstrated results are restricted to contexts with short time periods between the formation of an implementation intention and the side effect measurement. However, as performance improvement effects of implementation intentions have been repeatedly demonstrated in contexts with expanded temporal distances (e.g., Brandstätter, Heimbeck, Malzacher, & Frese, 2003; Orbell & Sheeran, 2000; Sheeran & Orbell, 1999), a replication of the present side effects would be expected even under an increased temporal distance. In addition, the demonstrated positive relation between performance improvement and attentional side effects of implementation intentions (Study 3) implies that the findings on the robustness of the performance improvement effects can also be transferred to attentional and behavioral side effects.

Finally, *consequences of implementation intentions for alternative means* should be examined. Similarly to potential interferences on the level of goals (Kruglanski et al., 2002), also *interferences between means* could be expected as a side effect of implementation intentions. Like habits, implementation intentions establish a relation between a goal and a specific mean (i.e., behavior that leads to goal attainment and is elicited by specified situational cues). Recent research on habit formation (Danner, Aarts, Bender, & de Vries, 2005) revealed that the repeated use of a specific mean led to the inhibition of alternative means. As implementation intentions establish a situation-behavior link for a specific goal, it could be expected that alternative means (i.e., behaviors that are not specified in an implementation intention) are inhibited as a consequence. This could result in ineffective choices of means. For example, if situational cues are present during the pursuit of other goals they could lead to an inhibition of means that would be adequate for the pursuit of the other goal that is actually pursued. Thus, future research should further investigate

side effects that result from the inhibition of alternative means that are not specified in an implementation intention.

6.3 Conclusions

When implementation intentions have automatic consequences they, as every automaticity, should lead to side effects as a downside under certain circumstances. The arguments and findings presented in this thesis allow the conclusion that implementation intentions can lead to unintended side effects. Such side effects have been demonstrated in form of costs of the automatic attraction of attention and of the generalization of the automatic initiation of behavior to situations where it did not serve goal attainment (i.e., during the pursuit of another goal than the one the implementation intention has been formed for). Furthermore, it has been shown that the behavioral side effects of implementation intentions can be modeled by environmental contexts. When social comparisons were provoked, behavior opposite to the one specified in the ingroup-directed implementation intention was initiated towards an outgroup. In addition, also performance improvements through implementation intentions were demonstrated in detection tasks as well as in judgments of social groups. Thus, the same processes (i.e., attraction of attention through situational cues, automatic initiation of behavior) that can promote the attainment of a goal can also hinder the successful pursuit of another goal. These results are a further step towards a comprehensive understanding of the benefits as well as the costs, the automatic processes of the self-regulatory metacognitive tool of implementation intentions have for goal pursuit.

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APPENDIX

German sentences used in Study 3 in the letter detection task containing the letters D/d. All D/d letters are underlined. Difficult detectable d letters are additionally written in italic letters.

In vielen Gegenden südlich der Alpen ist das Wetter meist sehr schön.

Das schöne Dorf im bayerischen Wald zog im Sommer viele Besucher an.

Für alle Studenten ist es unerlässlich, dass prinzipiell der Text zum Referat intensiv gelesen werden muss.

Fast auf der ganzen Welt ist ein Deo Teil der modernen Kosmetik.

Oft wechselt das Wetter auch mehrmals am gleichen Tag.

Für die Kunstwissenschaft ist es wichtig, dass ein Dia einen möglichst authentischen Eindruck eines Kunstwerks vermittelt.

Vor allem für Haushalte von Berufstätigen ist die Anstellung einer Putzfrau unvermeidlich.

Bei armen Leuten wird ein Dach mit Stroh gedeckt.

Weder Fleisch noch Fisch, sondern eine gesunde Lebensweise mit Gemüse ist die Alternative für Vegetarier.

Nicht nur für Betende, sondern auch für Kunstinteressierte ist ein alter Dom interessant und besuchenswert.

Westlich der Stadt München liegen die Orte Stuttgart und Ulm nahe beieinander.

Ein gutes Dia ist meist farbstärker als ein Negativ.

SUMMARY

Psychologists agree that goals are central to human functioning (e.g., Locke & Latham, 1990). Which goals one intends to achieve is defined by goal intentions ("I intend to achieve goal Z!"). They translate noncommittal desires into binding goals. But the distance between goal setting and goal attainment is often long (Gollwitzer, 1999). To improve goal attainment, implementation intentions can be formed that specify when, where, and how one intends to pursue a goal ("If situation X is encountered, I will perform behavior Y!"). Thus, implementation intentions are special plans, subordinate to goal intentions, which allow people to delegate the initiation of goal-directed behavior to environmental stimuli and thereby improve goal attainment. The goal of this thesis is to examine not only the benefits but particularly potential costs of implementation intentions.

Previous findings demonstrate that implementation intentions, even though they are formed through an intentional act of will, have automatic effects (for an overview, see Gollwitzer & Sheeran, 2006). They lead to an improved detection of the critical situation X (e.g., Aarts, Dijksterhuis, & Midden, 1999) and to the automatic initiation of the specified actions Y as soon as the specified situation X arises (e.g., Brandstätter, Lengfelder, & Gollwitzer, 2001). However, up to date no research has considered possible *unintended side effects of the automaticity of implementation intentions*, when situational cues of an implementation intention are present during the pursuit of another goal than goal Z. In two main research questions such unintended side effects were addressed. Whereas the first research question examined if implementation intentions *bias attention* as unintended side effects, the second research question examined if they *bias behavior* as unintended side effects.

Attentional side effects of implementation intentions were expected when situational cues included in an implementation intention show up in an unrelated task. It was tested that, as our attentional resources are limited, the attraction of attention through implementation intentions leads to costs in terms of diminished attention to other relevant cues. Three studies found support for this hypothesis. *Attention attraction effects* were shown in contexts with more than one important task dimension (Study 1) and in separate measurement in unrelated tasks (Study 2 and 3). Additionally, a positive relation between attention attraction effects and improved performance effects was demonstrated (Study 3). More attentional attraction co-occurred with improved performances through implementation intentions in a separate task.

Behavioral side effects of implementation intentions were expected when situational cues included in an implementation intention show up in unrelated tasks and the behavior specified in the implementation intention can be applied. It was argued that if the effects of implementation intentions are based on automaticity, behavior Y should result from the perception of cue X no matter whether the behavior has concurrently an impact on goal attainment or not. Thus, the automatic action initiation through implementation intentions should also occur during the pursuit of goals different from the one the implementation intention was formed for. In two studies support for this hypothesis was found. In Study 4 an intention to judge one outgroup positively *overgeneralized* to the judgments of a second outgroup when the situational cues X from the implementation intention directed at the first outgroup were present. This overgeneralization of behavior should, similar to automatic behavior (e.g., Schubert & Häfner, 2003), change into contrasting behavior, if a social comparison between the target of behavior and the self is triggered while the cue is perceived. As predicted, in Study 5 such *contrast behavior* in form of more negative judgments of a second outgroup was found, when the situational

cues X of an implementation intention to judge the ingroup positively, were present.

The present findings contribute to the literature on automatic effects of implementation intentions as well as to the literature on intergroup relations. They show that the automatic processes of implementation intentions can *bias attention* during the pursuit of other goals as unintended side effect. In addition, they demonstrate that group-directed implementation intentions can *bias behavior* towards other outgroups and that these side effects are moderated by the structure of the social environment. The same automatic processes (i.e., attention attraction, automatic action initiation) that can promote successful goal pursuit can also hinder it depending on the goal that is actually pursued. These results are a further step towards a better understanding of the automatic processes of implementation intentions and their benefits as well as costs for goal pursuit.

ZUSAMMENFASSUNG

Psychologen stimmen darin überein, dass Ziele zentral für das menschliche Funktionieren sind (z.B. Locke & Latham, 1990). Welche Ziele man zu erreichen beabsichtigt definiert man in Ziel-Intentionen („Ich beabsichtige Ziel Z zu erreichen!“). Sie überführen unverbindliche Wünsche in verbindliche Ziele. Trotzdem ist die Kluft zwischen der Setzung von Zielen und der Erreichung von Zielen oft groß (Gollwitzer, 1999). Um die Zielerreichung zu verbessern können Vorsätze gebildet werden, in denen man festlegt, wann, wo und wie man beabsichtigt ein Ziel zu verfolgen („Wenn Situation X auftritt, werde ich Verhalten Y ausführen!“). Vorsätze sind demnach spezielle Pläne, mit denen Ziel-Intentionen ausgestattet werden können. Sie erlauben es, die Initiierung von zielgerichteten Verhaltensweisen an Stimuli in der Umwelt zu delegieren und so die Zielerreichung zu verbessern. Es ist das Ziel dieser Arbeit nicht nur den Nutzen von Vorsätzen, sondern insbesondere potentielle Kosten von Vorsätzen zu untersuchen.

Bisherige Befunde zeigen, dass Vorsätze, auch wenn sie durch einen intentionalen Willensakt gebildet werden, automatische Effekte haben (für eine Übersicht, siehe Gollwitzer & Sheeran, 2006). So führen sie zur verbesserten Wahrnehmung der im Vorsatz definierten Stimuli X (z.B. Aarts, Dijksterhuis, & Midden, 1999) und zur automatischen Initiierung des festgelegten Verhaltens Y, sobald die definierten Stimuli X auftreten (z.B. Brandstätter, Lengfelder, & Gollwitzer, 2001). Allerdings fehlt in der bisherigen Forschung die Untersuchung von *möglichen Kosten der Automatik von Vorsätzen in Form von nicht-intendierten Nebeneffekten*, wenn situative Stimuli X eines Vorsatzes während der Verfolgung eines anderen Ziels als Ziel Z anwesend sind. In zwei Untersuchungsfragen wurden diese nicht-intendierten Nebeneffekte adressiert. Während die erste Frage darauf abzielte, ob Vorsätze die *Aufmerksamkeit* als

nicht-intendierten Nebeneffekt beeinflussen, zielte die zweite Frage darauf ab, ob Vorsätze *Verhalten* als nicht-intendierten Nebeneffekt beeinflussen.

Nebeneffekte von Vorsätzen in Bezug auf die Aufmerksamkeit wurden erwartet, wenn situative Stimuli X aus einem Vorsatz während der Bearbeitung anderer Aufgaben auftreten. Dabei wurde getestet, inwieweit aufgrund der beschränkten Aufmerksamkeitsressourcen die Anziehung von Aufmerksamkeit durch situative Stimuli X eines Vorsatzes zu einer verringerten Aufmerksamkeit auf andere relevante Stimuli führt. In drei Studien wurden Belege für diese Annahme gefunden. *Aufmerksamkeitsanziehungseffekte* wurden in Kontexten mit mehr als einer wichtigen Aufgabendimension (Studie 1), sowie bei der separaten Messung in einer unabhängigen Aufgabe (Studie 2 und 3) gezeigt. Zusätzlich wurde ein positiver Zusammenhang zwischen Aufmerksamkeitseffekten und verbesserter Leistung demonstriert (Studie 3). Mehr Aufmerksamkeitsanziehung trat zusammen mit verbesserten Leistungen durch Vorsätze in einer separaten Aufgabe auf.

Nebeneffekte von Vorsätzen in Bezug auf das Verhalten wurden erwartet, wenn situative Stimuli X aus einem Vorsatz während der Bearbeitung anderer Aufgaben auftreten, in denen das im Vorsatz festgelegte Verhalten anwendbar ist. Wenn die Effekte von Vorsätzen auf deren Automatik basieren, sollte das spezifizierte Verhalten Y auf die Wahrnehmung von Stimulus X folgen, unabhängig davon, ob das Verhalten Y der aktuellen Zielerreichung dient oder nicht. Das heißt, die automatische Verhaltensinitiierung durch Vorsätze sollte auch während der Verfolgung anderer als der im Vorsatz festgelegten Ziele stattfinden. In zwei Studien wurden Belege für diese Annahme gefunden. In Studie 4 *übergeneralisierte* die Intention, eine Fremdgruppe positiv zu bewerten auf die Bewertung einer zweiten Fremdgruppe, wenn Stimuli X aus dem Vorsatz für die erste Fremdgruppe anwesend waren. Dieses übergeneralisierende Verhalten sollte sich, ähnlich wie automatisches

Verhalten (z.B. Schubert & Häfner, 2003), in kontrastierendes Verhalten umkehren, wenn während des Erscheinens der situativen Stimuli X ein sozialer Vergleich zwischen dem Ziel des Verhaltens und dem Selbst angeregt wird. Wie vorhergesagt, wurde in Studie 5 dieses *Kontrastverhalten* in Form von negativeren Bewertungen einer zweiten Fremdgruppe gefunden, wenn Stimuli X aus dem Vorsatz, die Eigengruppe positiv zu bewerten, anwesend waren.

Die vorliegenden Befunde tragen zur Forschung zu automatischen Effekten von Vorsätzen wie auch zur Forschung zu Beziehungen zwischen sozialen Gruppen bei. Sie demonstrieren, dass die automatischen Prozesse von Vorsätzen als nicht-intendierter Nebeneffekt die *Aufmerksamkeit* bei der Verfolgung anderer Ziele beeinflussen können. Zusätzlich zeigen sie, dass gruppen-bezogene Vorsätze *Verhalten* gegenüber anderen Fremdgruppen beeinflussen können und dass diese Nebeneffekte durch die Struktur der sozialen Umwelt moderiert werden. Die gleichen Prozesse (d.h. Aufmerksamkeitsanziehung, automatische Verhaltensinitiierung), die die Zielerreichung verbessern können, sie ebenso behindern je nach dem, welches Ziel gerade verfolgt wird. Diese Befunde sind ein weiterer Schritt zu einem verbesserten Verständnis von automatischen Prozessen von Vorsätzen und ihren Nutzen wie auch ihren Kosten für die Zielverfolgung.

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EHRENWÖRTLICHE ERKLÄRUNG

Ich erkläre hiermit, dass mir die geltende Promotionsordnung der Fakultät für Sozial- und Verhaltenswissenschaften bekannt ist.

Ferner erkläre ich, dass ich die vorliegende Arbeit selbst und ohne unzulässige Hilfe Dritter angefertigt habe. Alle von mir verwendeten Hilfsmittel und Quellen sind in der Arbeit angegeben. Insbesondere habe ich hierfür nicht die Hilfe eines Promotionsberaters in Anspruch genommen und Dritte haben weder unmittelbar noch mittelbar geldwerte Leistungen von mir für Arbeiten erhalten, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen.

Die Arbeit wurde weder im Inland noch im Ausland in gleicher oder ähnlicher Form einer anderen Prüfungsbehörde vorgelegt. Weder früher noch gegenwärtig habe ich an einer anderen Hochschule eine Dissertation eingereicht.

Ich versichere, dass ich nach bestem Wissen die reine Wahrheit gesagt und nichts verschwiegen habe.

Jena, den 14. November 2005

Ort, Datum

Unterschrift